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ORIGINAL ARTICLES

PRACTICAL PEDODONTIA, OR JUVENILE OPERATIVE DENTISTRY AND PUBLIC HEALTH DENTISTRY*

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CHAPTER I

INTRODUCTION

AS an introduction it is best to have a general idea of the subject and the relation it bears to the future practice of dentistry.

We are living in an age of prevention. For instance, we have established a system of fire prevention and our cities are defended by highly trained fire-fighters. Our forest reserves are carefully watched for possible forest fires by forest rangers, the latest in that line being the use of aeroplanes for detecting incendiary outbreaks. The hills and mountains are crossed by clear areas of immunity called "fire breaks."

In the industrial world dangerous machinery is now supplied with safety devices. Large laundries have safety devices to save fingers and hands. Our urban railroads are introducing safety devices of all kinds, the latest being the unpopular one man car.

In the educational world the child is taught what to read and what not to read, a prevention against future moral breakdown.

We have preventive systems in all lines of endeavor. In medicine which is closely allied to our work, preventive measures which insure better health

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to the community and the individual are being practiced. In the fight against tuberculosis in many communities, homes are being built called "preventoriums," which are provided for borderline cases, thus rescued from the

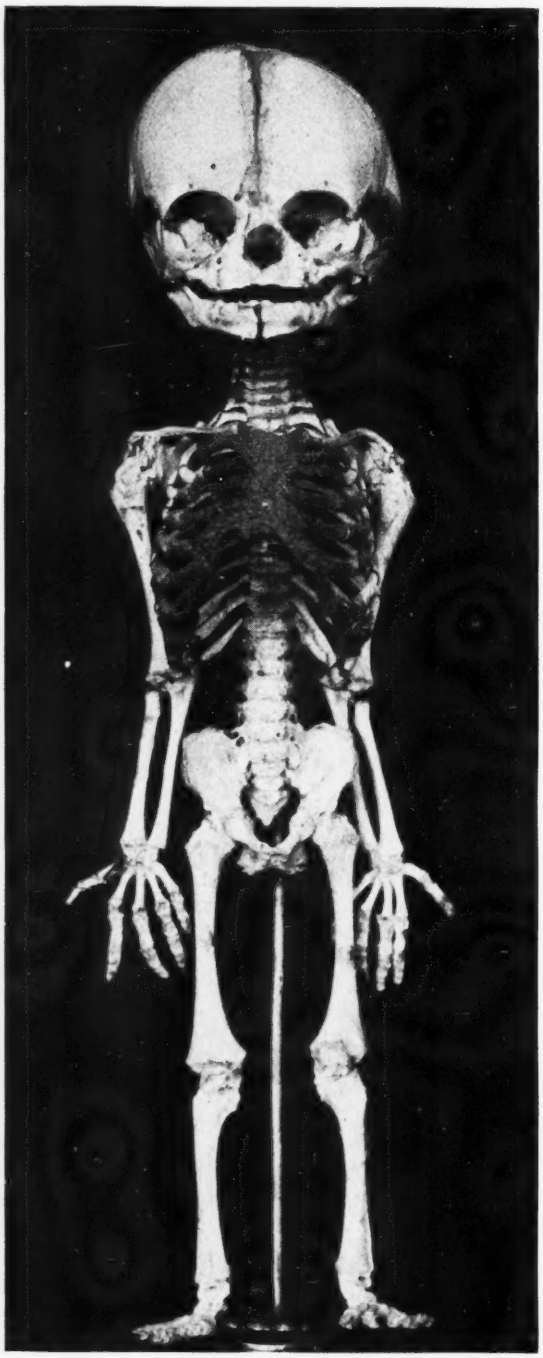


Fig. 1.—Skeleton of a baby after birth. (Anatomical Department, College of Dentistry, U. S. C.)

onslaught of this plague. For the same reason the "open air" schools are springing up. Preventive vaccines are being developed. Sanitary dairy inspection is prevention. Vaccination and quarantine are preventive meas-

ures. And so all around us and in every walk of life prevention is the constant ideal sought.

But prevention as applied to dentistry is not altogether a definable word. In the main we aim to preserve the oral cavity in a state of health, but it is an ever changing field. Conditions change rapidly in the human economy and are reflected in the mouth.

The dentist has different conditions to face in the youth and in the adult or aged. So it is plain that the meaning of preventive dentistry depends in a measure upon the viewpoint. In other words it is a relative term.

Definition.—Prevention, therefore, as applied to dentistry means a minimizing of those adverse conditions of life which tend to shorten the period of dental efficiency.

Our viewpoint will be the childhood period; that is, we shall survey the conditions of life up to the teen age.

MANAGEMENT OF THE CHILD

The psychology of the child is a separate study of philosophy, and to lay down rules for dental students is almost impossible. I may, however, make a few which will be suggestions of material value.

Rule 1.—Become acquainted and gain the confidence of the child. This holds true with adults as well as with children. An adult is open to argument, but not so the average child. He has an almost instant instinct for liking or disliking a stranger. Therefore from the very start it is necessary to make no false moves. Quietly but firmly make the usual arrangements at the chair, at the same time keeping the parents as far from the scene of action as possible. It is best to exclude the parents from the room after the first visit.

The best way to gain the child's attention is to give a prophylactic treatment, using soft rubber cups at first. This will secure his confidence and allay his fears. Keep the little patient only a short time at the first visit.

Rule 2.—Keep the child not longer than one-half or three-quarters of an hour in the chair.

Rule 3.—Do not deceive the child, but take him into your confidence and treat him as you would an adult. If you intend to hurt the child do not deceive him, but tell the truth. If the child is once fooled, his trust is seldom regained.

Rule 4.—Never force a child or break down his courage. This rule should not be broken except in absolute necessity.

CHAPTER II

EMBRYOLOGY. DEVELOPMENT OF THE CHILD'S HEAD

In this chapter a short résumé of prenatal development is given. To understand growth and development it must be followed from the beginning.

The term *embryology* in its widest sense, is applied to the various changes which take place during the growth of an animal from the egg to the adult state; it is, however, usually restricted to the phenomena which occur before birth.

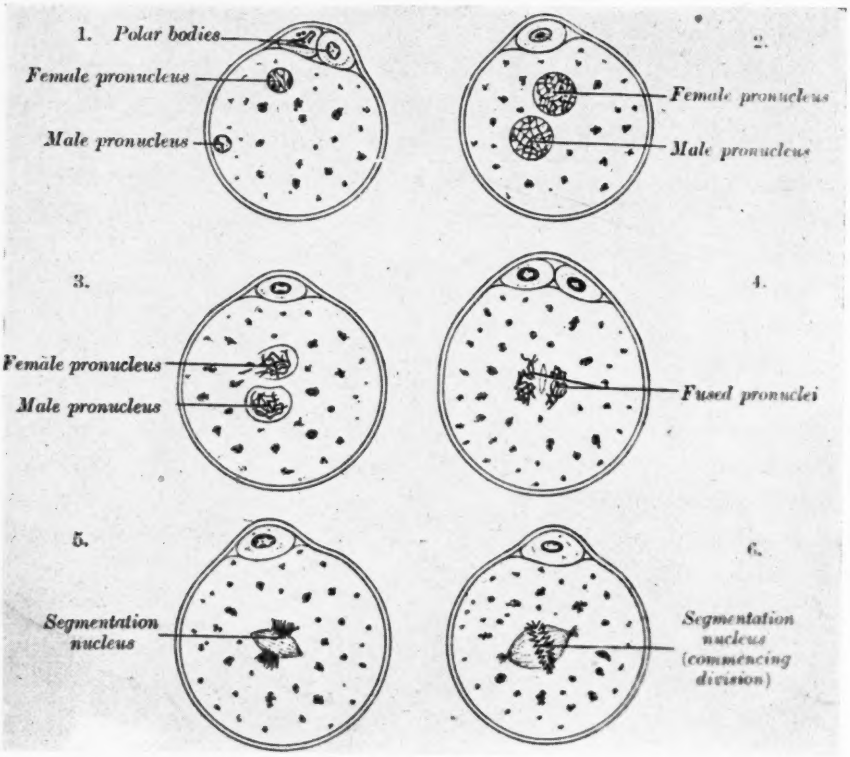


Fig. 2.—The process of fertilization of the ovum of a mouse. (Sobotta.)

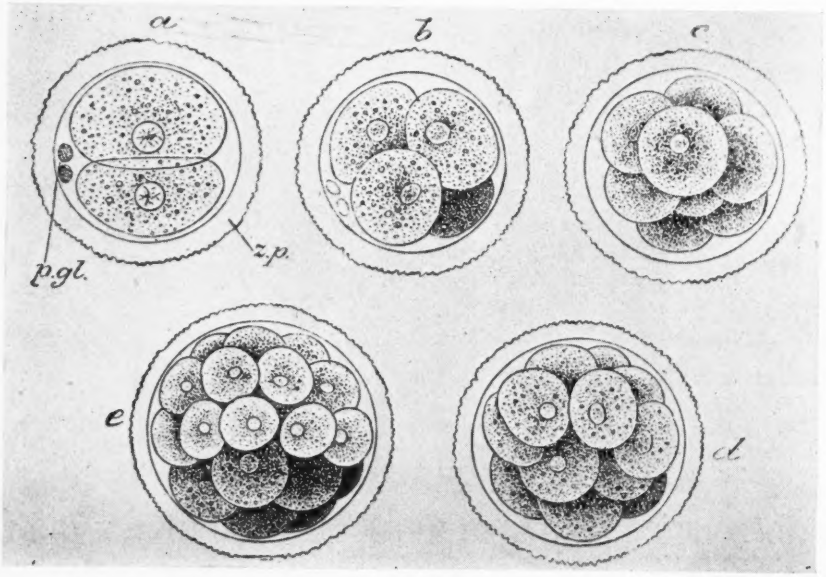


Fig. 3.—First stages of segmentation of a mammalian ovum. Semidiagrammatic. (From a drawing by Allen Thomson.)

z, *p*, Zona striata; *p*, *gl*, polar bodies; *a*, two-cell stage; *b*, four-cell stage; *c*, eight-cell stage; *e*, morula stage. (Gray.)

Ontogeny deals with development of the individual.

Phylogeny is the study of the evolutionary history of the animal kingdom.

Somatic Cells function to build up various tissues of the body.

Germinal Cells are designed for the perpetuation of the species.

For our purpose the study of the maturation of the ovum, and the formation of the spermatozoa is unnecessary. It is enough to know that when the

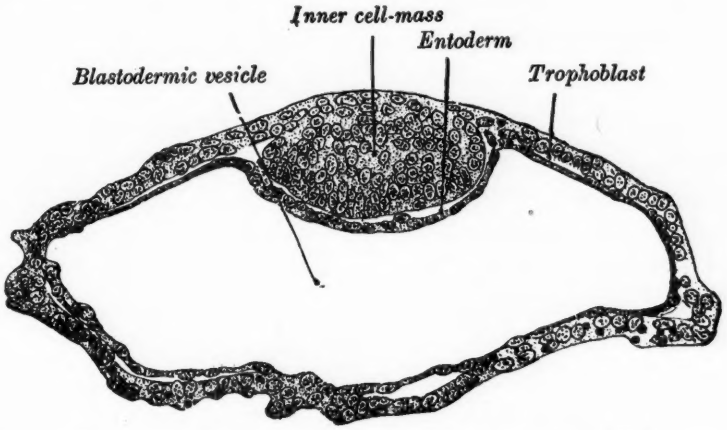


Fig. 4.—Blastodermic vesicle. (After van Beneden.)

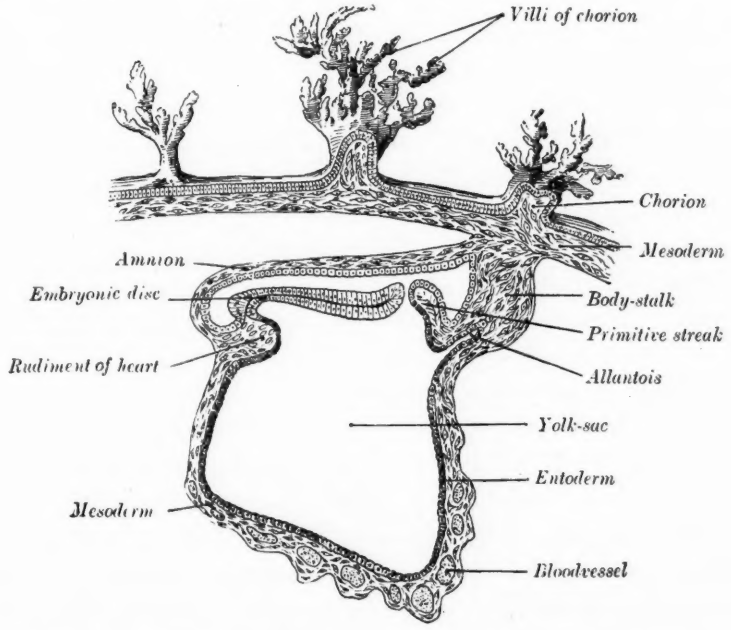


Fig. 5.—Section through the embryo. (After Graf Spee.)

female cell becomes fully formed and ready for expulsion the number of the chromosomes is half of the original number. Likewise in the spermatozoon the chromosomes is half of the original number.

FERTILIZATION OF THE OVUM (Figs. 2 and 3)

With the union of the spermatozoon and the mature ovum, fertilization takes place. Fertilization probably takes place in the lateral or ampulatory

part of the uterine tube. It takes about seven or eight days for the journey down in the cavity of the uterus during which the ovum undergoes segmentation.

Normally one spermatozoon enters the yolk. It loses its tail while the head and connecting piece assume the form of a nucleus containing a cluster of chromosomes. This is the *male pronucleus* which with the female pronucleus fuses to form a new nucleus, the *segmentation nucleus.* By this union the number of chromosomes is restored to the original number in the somatic cells.

SEGMENTATION

The segmentation nucleus divides into two cells which in turn divide into four, eight, sixteen, etc. This first mass of cells is called the *morula.*

The morula divides into an outer layer called the *trophoblast* and an inner layer, the *inner cell mass* from which the embryo develops.

Liquid collects between the inner cell mass and the trophoblast forming the blastodermic vesicle (Fig. 4).

The inner cell mass remains in apposition to the trophoblast at one point called the embryonic pole at which point the future embryo will develop.

The *yolk sac* is formed from the cells of the deep surface of the *inner cell mass.*

Spaces between the remaining cells of the inner cell mass form, which gradually become the *amniotic cavity* (Fig. 5).

The floor of the amniotic cavity is formed by the embryonic disk.

Up to this point we have the entoderm formed from the inner cell mass and the ectoderm or the cells composing the outer layer of the inner cell mass. The next step is the formation of the mesoderm.

Near the posterior end of the pear-shaped embryonic disk the *primitive streak* appears for about one-half the length of the embryonic disk.

The *primitive groove* appears on the surface of the streak and communicates by a narrow aperture with the yolk sac.

From the sides of the primitive streak a third layer of cells is formed, the *mesoderm.* This extends laterally between the ectoderm and entoderm. This extension is complete except in certain areas. One of interest to us is immediately in front of the neural tube. The mesoderm extends forward in two crescentric masses. They meet in the middle over an area devoid of mesoderm but a membrane is formed by the ectoderm and entoderm to form the *buccopharyngeal membrane.* This forms a septum between the primitive mouth and pharynx.

The blastoderm now consists of three layers:

1. The ectoderm .....inner lining.
2. The mesoderm .....middle lining.
3. The entoderm .....outer lining.

Ectoderm gives rise to:

1. Nervous system.
2. Epidermis.

3. Lining cells of sebaceous, sudoriferous and mammary glands.
4. Hair, nails, *enamel of the teeth.*
5. Epithelium of nose and adjacent air sinuses, cheeks and roof of mouth.
6. Anterior lobe of hypophysis cerebri.
7. Epithelium of the cornea, conjunctiva, lacrimal glands, neuroepithelium of the sense organs.

Entoderm gives rise to:

1. Epithelium lining of the digestive tube, except the mouth, pharynx and terminal part of the rectum.
2. Lining of all glands which open into the digestive tube.
3. Epithelium of auditory tube and tympanic cavity.
4. Trachea, bronchi, air cells of lungs, urinary bladder and part of urethra.
5. Epithelium which lines the follicle of the thyroid gland and thymus.

Mesoderm gives rise to the remaining tissues of the body.

THE NEURAL GROOVE AND TUBE

"In front of the primitive streak two longitudinal ridges, caused by the folding up of the ectoderm, make their appearance, one on either side of the middle line." (Gray.)

These *neural folds* form the *neural groove* which in turn becomes the *neural tube* or *canal* as the folds elevate, meet, and coalesce. The ectodermal wall of the neural tube is the rudiment of the nervous system.

The inner layer folds off a blind pouch from the general cavity of the sphere which is to form the anterior part of the alimentary canal.

"The cephalic end of the neural groove exhibits several dilatations, which when the tube is closed, assume the form of three vesicles; these constitute the three primary cerebral vesicles and correspond respectively to the future forebrain, midbrain, and hindbrain." (Gray.)

THE NOTOCHORD

"The *notochord* consists of a rod of cells situated on the ventral aspect of the neural tube; it constitutes the foundation of the axial skeleton, since around it the segments of the vertebral column are formed." (Gray.) It appears about the same time as the neural tube.

It extends throughout the entire length of the future spinal column. The mesoderm surrounding the neural tube and notochord gives rise to the membranes of the brain and medulla spinalis.

THE PRIMITIVE SEGMENTS

About the end of the second week transverse segmentation of the paranchial mesoderm begins and it is converted into a series of well defined, more or less cubical masses, the *primitive segments,* which occupy the entire length of the trunk on either side of the middle line from the occipital region of the head.

These primitive segments grow and are the rudiments of the skeleton.

SEPARATION OF THE EMBRYO (Figs. 6 to 11)

"The embryo rapidly increases in size, but the circumference of the embryonic disk, or line of meeting of the embryonic and amniotic parts of the ectoderm, is of relatively slow growth and gradually comes to form a

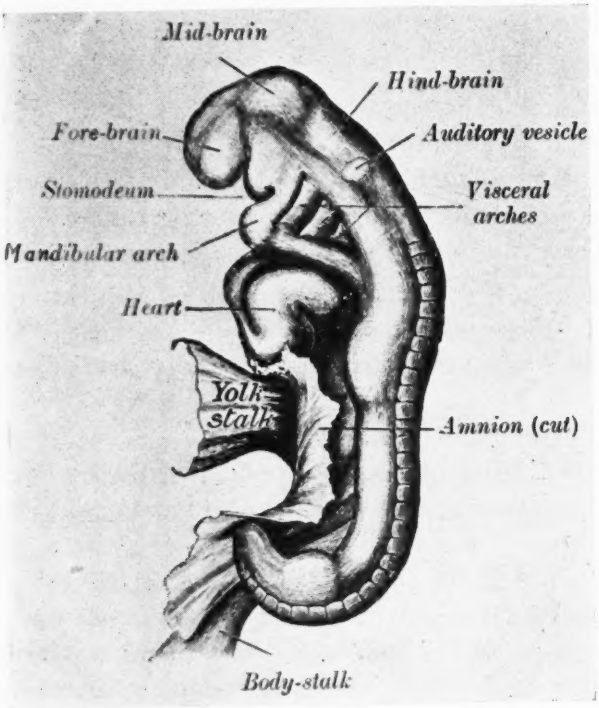


Fig. 6.—Embryo between eighteen and twenty-one days. (His.)

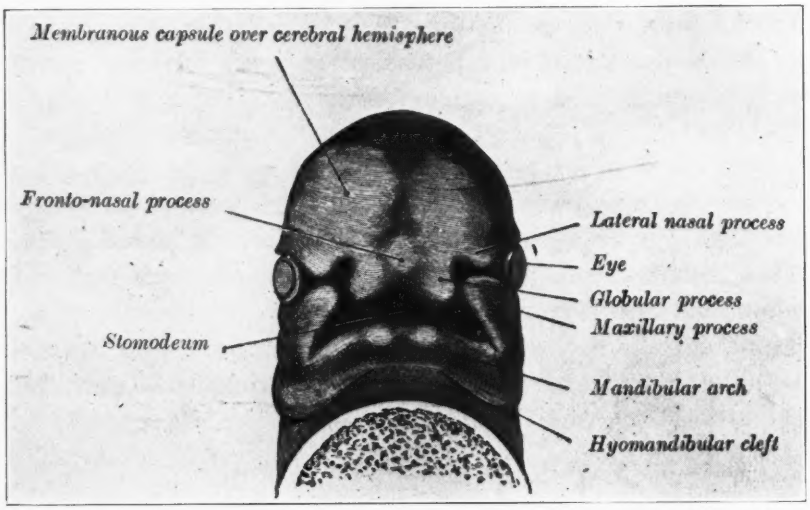


Fig. 7.—Under surface of the head of a human embryo about twenty-nine days old. (His.)

constriction between the embryo and the greater part of the yolk-sac. By means of this constriction, which corresponds to the future umbilicus, a small part of the yolk-sac is enclosed within the embryo and constitutes the primitive digestive tube.

"The embryo increases more rapidly in length than in width, and its cephalic and caudal ends soon extend the corresponding parts of the circumference of the embryonic disk and are bent in a ventral direction to form the *cephalic* and *caudal* folds respectively. The cephalic fold is first formed, and as the proamniotic area lying immediately in front of the pericardial area forms the anterior limit of the circumference of the embryonic disk,

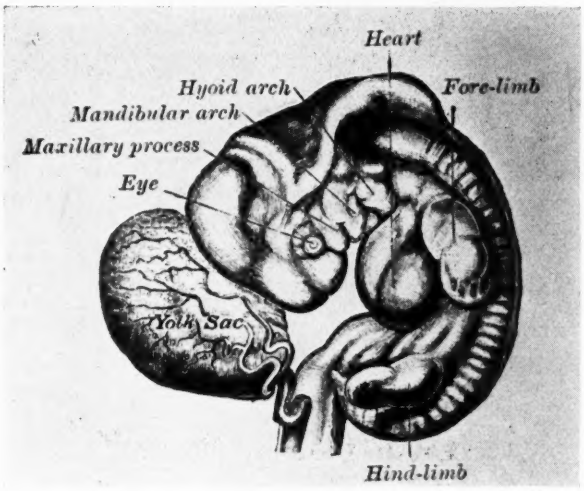


Fig. 8.—Human embryo from thirty-one to thirty-four days. (His.)

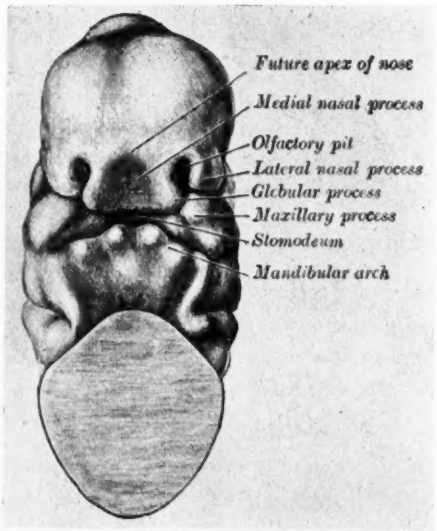


Fig. 9.—Head end of human embryo of about thirty to thirty-one days. (Peter.)

the forward growth of the head necessarily carries with it the posterior end of the pericardial area, so that this area and the buccopharyngeal membrane are folded back under the head of the embryo which now encloses a diverticulum of the yolk-sac named the *fore-gut* the caudal end of the embryo is at first connected to the chorion by the band of mesoderm called the *body-stalk,* but with the formation of the caudal fold the body-stalk assumes a ventral position; a diverticulum of the yolk-sac extends into the tail fold

and is termed the *hind-gut.* Between the fore-gut and the hind-gut there exists for a time a wide opening into the yolk-sac, but the latter is gradually reduced to a small pear-shaped sac (sometimes termed the *umbilical vesicle*), and the channel of communication is at the same time narrowed and elongated to form a tube called the *vitelline duct.* (Gray.)

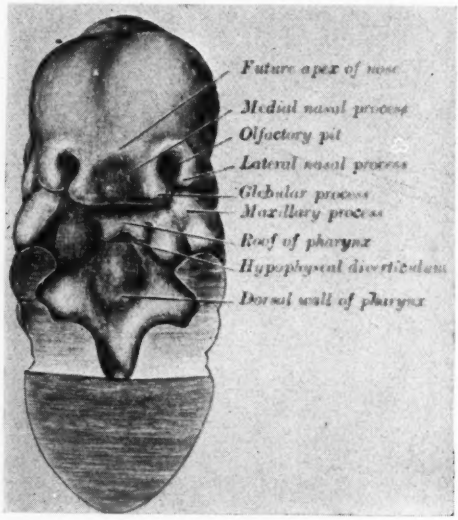


Fig. 10.—Same embryo with front wall of pharynx removed.

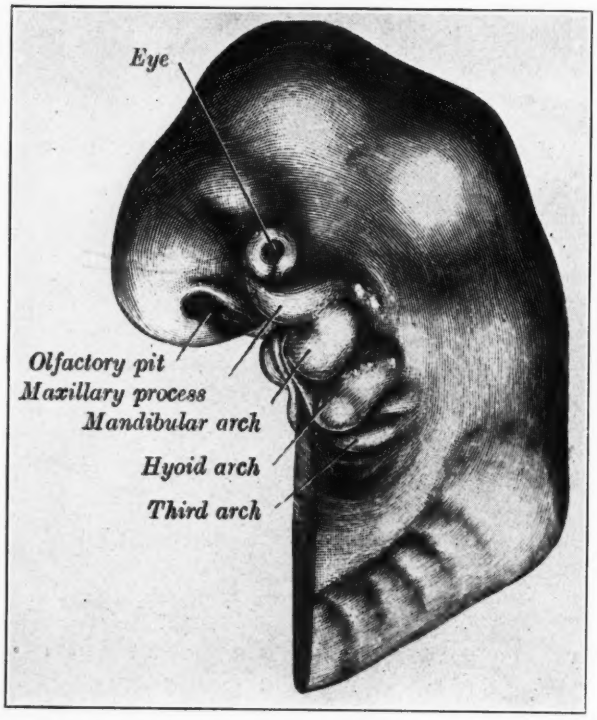


Fig. 11.—Head end of human embryo, about the end of the fourth week. (Peter.)

THE YOLK-SAC

"The yolk-sac is situated on the ventral aspect of the embryo. It is lined by entoderm, outside of which is a layer of mesoderm. It is filled

with fluid, the *vitelline fluid,* which possibly may be utilized for the nourishment of the embryo during the earlier stages of its existence.

"At the end of the fourth week the yolk-sac presents the appearance of a small pear-shaped vesicle (umbilical vesicle) opening into the digestive tube by a long narrow tube, the *vitelline duct.*" (Gray.)

MEMBRANES OF THE EMBRYO

The *amnion* is a membranous sac which surrounds and protects the embryo.

The *umbilical cord* attaches the fetus to the placenta; its length at full time as a rule, is about equal to the length of the fetus, i.e., about 50 cm., but it may be greatly diminished or increased.

The *body stalk* is the posterior segment of the embryonic area, and is attached to the chorion.

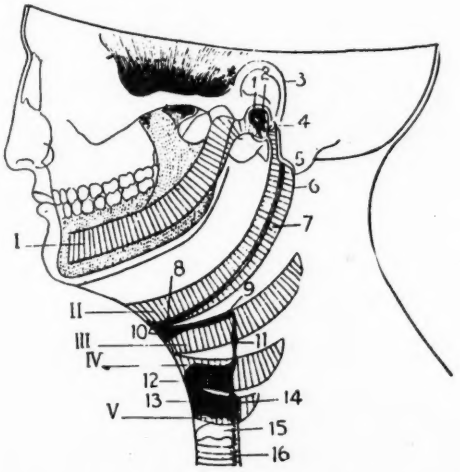


Fig. 12.—Diagram to illustrate the metamorphosis of the visceral arches during development. *I,* Presents the first visceral arch, it gives rise to Meckel's cartilage, which becomes transformed into the mandible. (After Wiedersheim.)

The *decidua.* Before the fertilized ovum reaches the uterus, the mucous membrane of the body of the uterus undergoes important changes and is then known as the decidua.

The *chorion* consists of two layers: an outer formed by the primitive ectodermic trophoblast, and an inner by the somatic mesoderm; with this latter the amnion is in contact.

The *placenta* connects the fetus to the uterine wall, and is the organ by means of which the nutritive, respiratory, and excretory functions of the fetus are carried on. It is composed of *fetal* and *maternal portions.*

THE BRANCHIAL OR VISCERAL ARCHES (Figs. 12 to 15)

The embryological and histological development of this part of the human body preeminently demands careful study by the dentist and oral surgeon. Heretofore we sketched the development of the whole body structure. From now on we shall confine ourselves to the dental and oral structures.

The pharyngeal pouches appear in the anterior part of the fore-gut on

the lateral walls. The ectoderm is indented over these pouches forming the *branchial* or *outer pharyngeal grooves.*

The grooves separate the *branchial* or *visceral arches.* At the dorsal ends these arches are connected with the head, while the ventral extremities meet in the middle line of the neck.

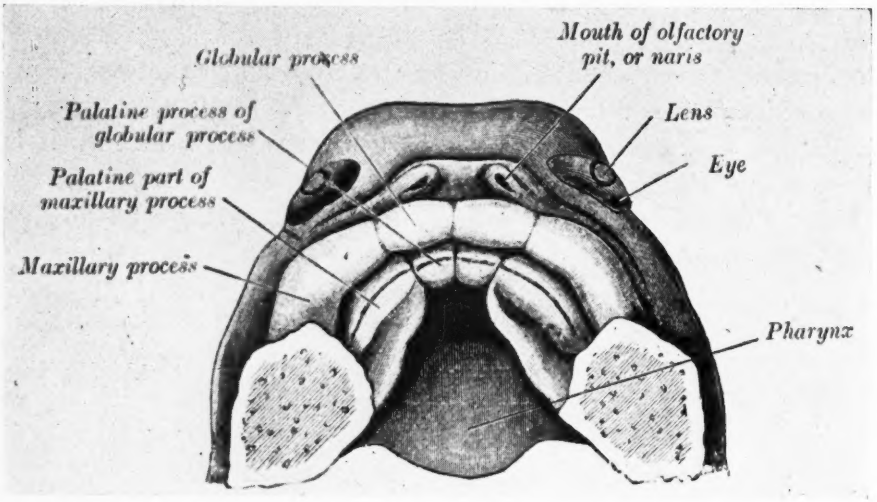


Fig. 13.—The roof of the mouth of a human embryo aged about two and a half months, showing the mode of formation of the palate. (His.)

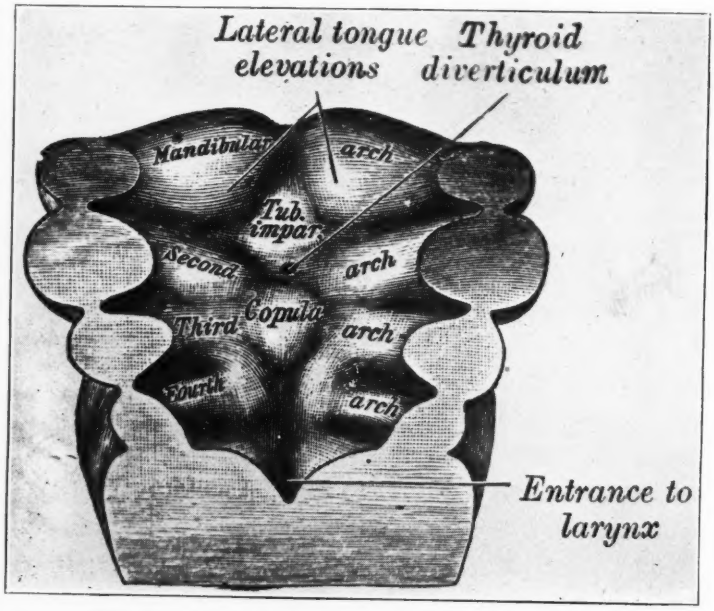


Fig. 14.—Floor of pharynx of embryo. (Gray.)

The *first arch* is called the *mandibular.*

The *second arch* is called the hyoid. There is a cartilaginous bar which develops in each arch, also a blood vessel in each called the primitive aortic arch.

The *mandibular arch* is located between the first branchial groove and the stomodeum (primitive mouth cavity) from which develops:

1. The lower lip.
2. The mandible.
3. The muscles of mastication.
4. The anterior part of the tongue.

The cartilaginous bar is known as *Meckel's cartilage* (right and left halves).

The dorsal ends of these cartilages are connected with the ear capsules and later ossify to form the bones of the middle ear, the malleus and incus. The neutral ends meet at the symphysis menti. The part of the mandible which contains the incisor teeth is regarded as being formed from this portion of Meckel's cartilage. (Fig. 16.)

"The intervening part of the cartilage disappears; the portion immedately adjacent to the malleus and incus is replaced by fibrous membrane, which constitutes the sphenomandibular ligament, while from the connective tissue covering the remainder of the cartilage the greater part of the mandible is ossified." (Gray.)

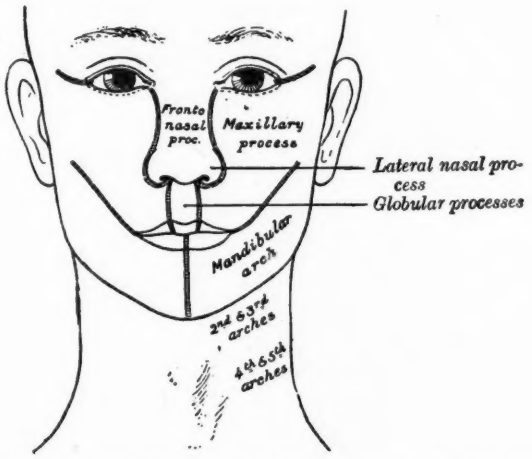


Fig. 15.—Diagram showing the regions of the adult face and neck related to the fronto-nasal process and the branchial arches. (Gray.)

The dorsal ends of the mandibular arch give rise to a triangular process, the *maxillary process,* which grows forward on either side and forms the cheek and lateral part of the upper lip.

The side and front of the neck is formed from the *second* or *hyoid* arch. Its cartilage gives rise to the styloid process, stylohyoid ligament and lesser cornu of the hyoid bone. The greater cornu of the hyoid bone arises from the third arch.

FORMATION OF THE FACE ELEMENTS

Beginning about the third week the face and nose start to develop. At first appear the *olfactory areas* which appear immediately under the fore-brain. The *frontonasal* process divides the two areas in the center.

These olfactory areas develop into the olfactory pits or rudimentary nasal cavity. The *medial* and *lateral nasal processes* are formed by the olfactory pits from the frontonasal processes. The *globular processes* are the rounded lateral portion of the medial processes.

From the posterior of the globular process, plates develop which become the nasal septum. The frontonasal, globular, and maxillary processes unite in the median line to form the *premaxillary bones* and the *philtrum* of the lip.

The *maxillary process* grows forward from a continuation of the mandibular arch, from which it is separated by a notch.

The maxillary process (1) forms the lateral wall and floor of the orbit, (2) and the zygomatic and greater part of the maxillary bones are formed from it.

The maxillary process joins with the lateral nasal and globular processes to form the lateral parts of the upper lip and posterior border of the nasal cavities.

The lower parts of the lateral walls of the nasal cavities are formed from the maxillary process. The lateral nasal process gives rise to (1) roof of the nose, (2) remaining part of the lateral wall.

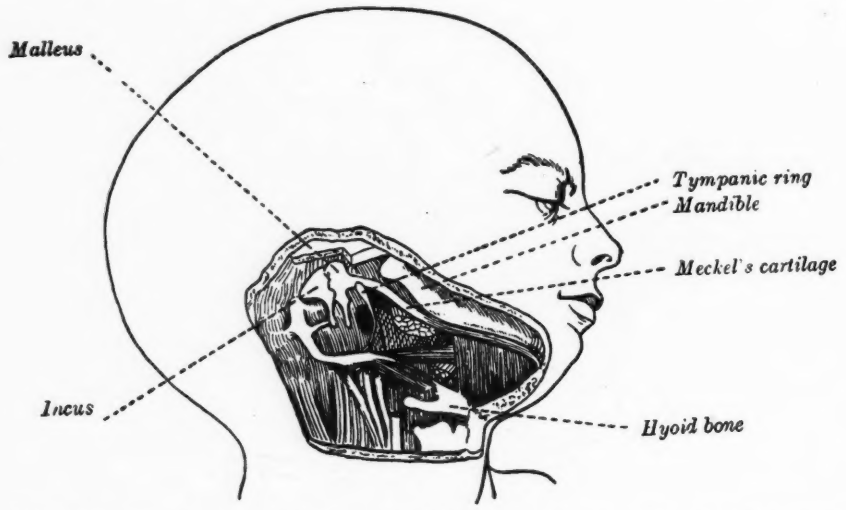


Fig. 16.—Head and neck of a human embryo eighteen weeks old, with Meckel's cartilage and hyoid bar exposed. (After Kolliker.)

The *primitive palate* is formed (1) by the junction of the maxillary and nasal processes in front, (2) by the apposition of the palatine processes of the maxillary processes posteriorly, (3) by the joining of the premaxillary bones.

The closing of the palate which starts in front about the eighth week, extends backward through the maxillary and palatine processes closing the soft palate about the eleventh week.

Cleft palate results from nonunion of the palatine processes.

Harelip results from nonunion of the maxillary and globular processes.

DEVELOPMENT OF THE TEETH (Figs. 18 to 23)

Before the formation of the bony structures of the jaws, about the middle of the second month or about the fiftieth to the sixtieth day of embryonal development, the first indications of dental structures appear. There

occurs a thickening or heaping up of the oral epithelium over the areas of the future alveolar structures, called the *dental band or ridge.* The V-shaped trough formed by the underlying connective tissue is termed the *dental groove.* The *epithelial band* is a group of epithelial cells which grow into the underlying connective tissue and lie in the dental groove. A continuous *dental lamina* is given off toward the lingual from the epithelial band in the manner of a shelf.

At twelve points on the dental lamina an epithelial cord is given off in the form of rounded bodies which develop into bell-shaped *tooth buds.* This occurs about the seventh or eighth week. The hollow of the bell is caused by a growth of connective tissue cells and later becomes the *dentine* organ. The enamel organ is composed of an *external* and *internal* layer of epithelium;

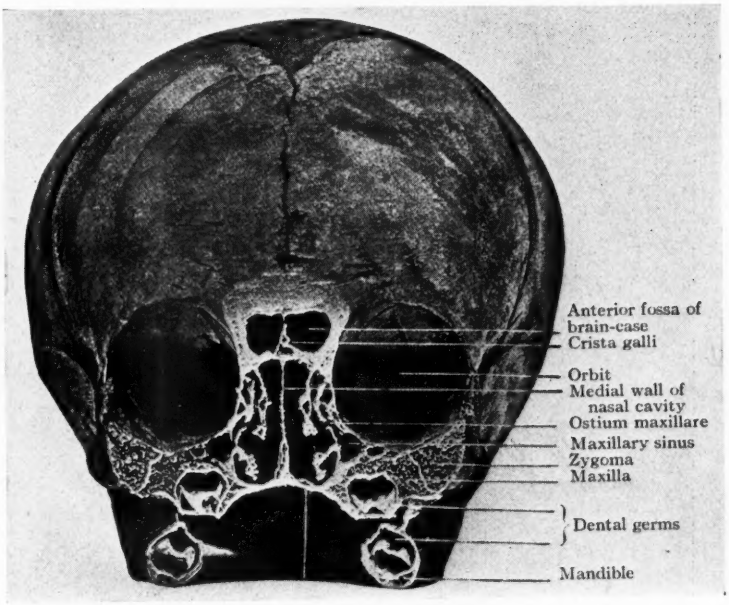


Fig. 17.—Skull of a fully developed embryo cut vertically through the first deciduous premolar. (Cryer.)

the *stratum intermedium,* and *stellate reticulum,* occupying the intervening portions (see Fig. 20).

The enamel is formed by *ameloblasts* on the inner lining of the bell-shaped enamel organ. The dentine is formed from *odontoblasts* in apposition to the enamel organ but placed on the outer surfaces of the *dentine papilla.*

"The enamel organ of all the deciduous teeth may be said to appear about the eighth week of embryonic life; the dental papilla about the ninth week; the *follicular wall* which encircles the tooth follicle, (i. e., enamel organ and dental papilla), rises from the base of the dental papilla and appears at the tenth week; the follicle closure and simultaneous rupture of the cord occurs about the thirteenth week; and the formation of dentine begins about the sixteenth week." (Endelman and Wagner).

About the sixteenth week of intrauterine life the enamel buds of the

permanent teeth begin to develop from the epithelial cord of the corresponding deciduous tooth. The enamel buds of the first, second, and third molars do not have their genesis from deciduous tooth buds. About the fifteenth week the first molar develops by a separate invagination of the dental ridge. About the third month after birth the second molar develops from an epithelial cord given off from the first molar tooth bud; and the third molar develops from an off-shoot of the second molar, about the second or third year after

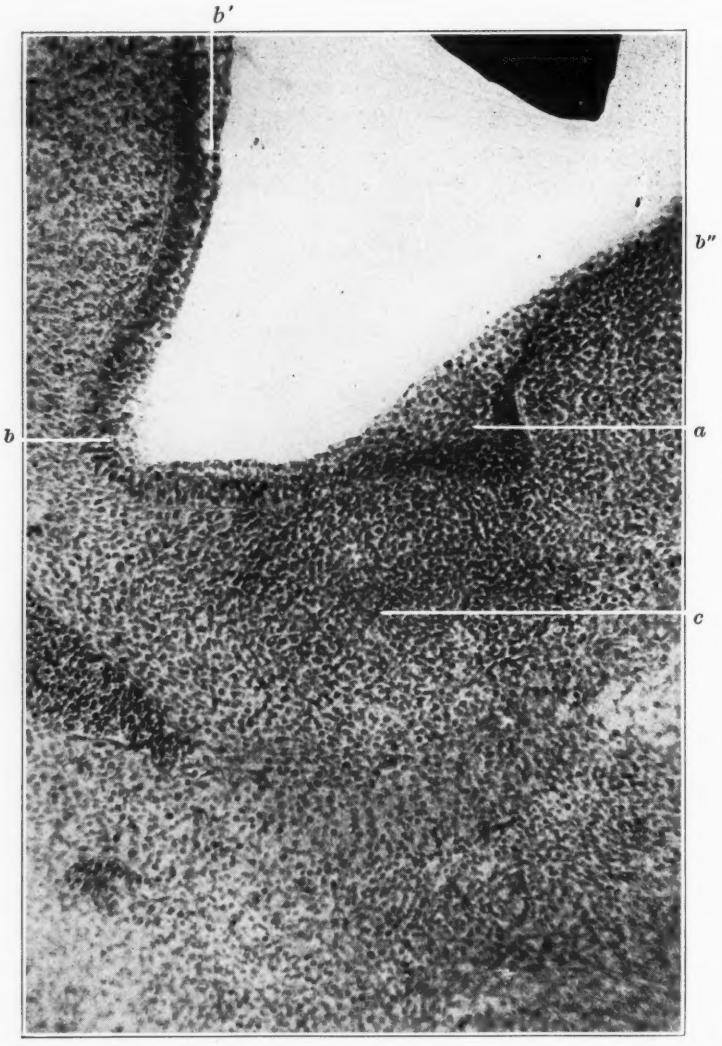


Fig. 18.—First evidence of tooth development. The stratified squamous epithelium is seen dipping into the subadjacent connective tissue and forming the dental band or ridge. *a*, Epithelial band progressing in the direction of the underlying connective tissue; *b*, *b'*, *and b''*, thickened epithelial layer; *c*, underlying connective tissue. (Endelman and Wagner.)

birth. Dentification or dentine formation takes place from the surface of the dentine papilla inward and precedes amelification, or enamel formation, by a few days. Amelification advances from the inner surface of the enamel organ outward. (Fig. 22.)

The outer layer of cells of the follicular wall are the active agents in building up the bony structures of the alveolar wall.

The inner layer of cells function to build up cementum. The peridental membrane comes into existence by virtue of the intervening cells.

THE PERIOD FROM BIRTH TO FIVE YEARS (Figs. 24, 25)

Kirk in one of his papers calls this the "period of dentitional stress." At birth the mandible is almost horizontal, there being very little elevation at the angle. As the child begins to grow the height of the mandible and

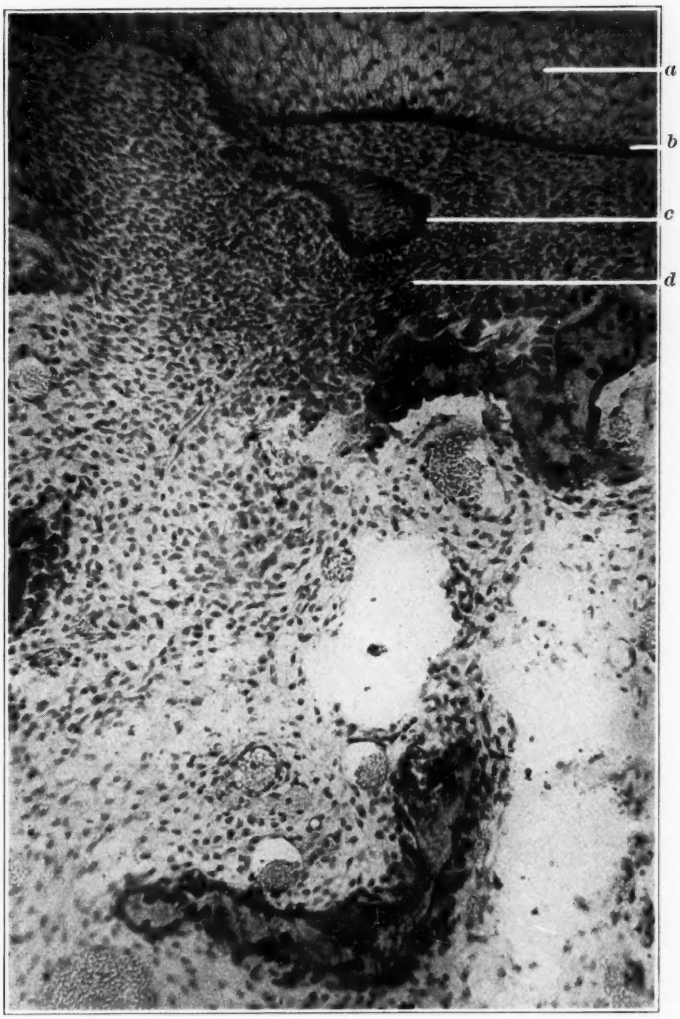


Fig. 19.—A slightly later stage than in the preceding illustration showing the beginning of the invagination of the epithelial cord which will result in the formation of the four layers of the enamel organ. *a*, Epithelial cells from the more superficial or older strata of the Malpighian layer; *b*, younger strata from Malpighian layer from which dipping of epithelium occurs; *c*, epithelial cord beginning to undergo the invagination which will result in the formation of the four distinct groups of cells of the enamel organ; *d*, condensation of underlying connective tissue. (Endelman and Wagner.)

maxilla increases. That is, there is an increase in alveolar substance. The ramus begins to turn upward at a very obtuse angle. At six months there is a smaller angle at the ramus with an increased size of the mandible. The maxilla correspondingly grows. At eighteen months the ramus of the mandible stands at quite an angle.

At birth all the teeth except the second and third molars have begun to develop. The tooth buds lie embedded in the cancellous substance of the jaw bones.

A study of the infant jaw bones reveals the cribriform effect produced by the tooth buds occupying the spaces in the maxilla almost to the floor of the orbit, and in the mandible down to the mandibular canal.

The multiplication of the cells seems to be the *growth factor,* aided by the blood pressure to a degree. As the tooth enlarges it pushes the walls of the crypt in two directions until the root portion is braced against the dense bone. Then it begins to force the alveolar portion ahead of it thereby causing an enlargement of the alveolar parts.

Accessory factors in the development of the jaws are the muscles involved. The tongue on the inside always pushing outward and the cheek muscles

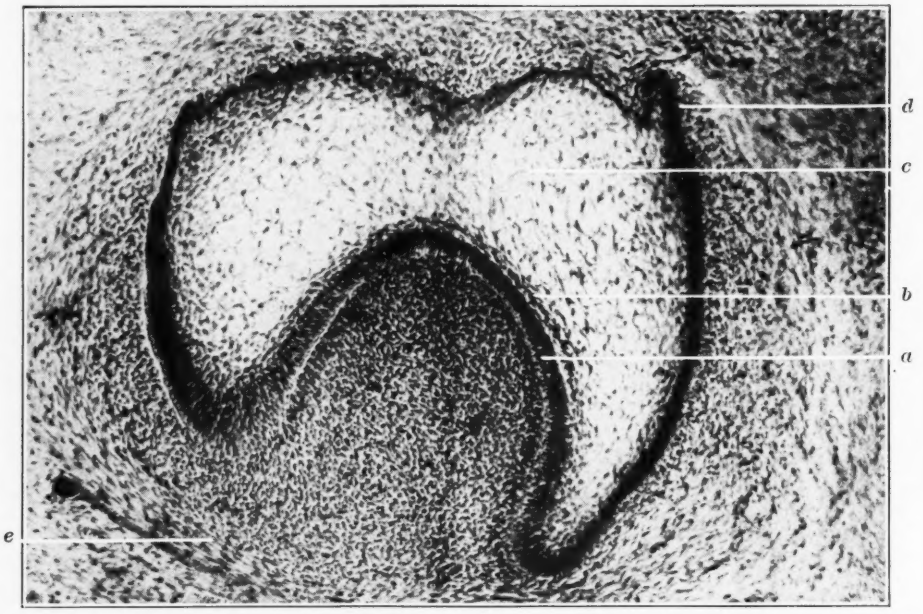


Fig. 20.—The four sets of the enamel organ; *a*, the internal or the layer of the ameloblasts; b, cells of the stratum intermedium; *c*, cells of the stellate reticulum, and *d*, of the external layer. Portions of the follicular sac are seen at *e*, surrounding the dental papilla and enamel organ; from the follicular wall the cementum and alveolar process will develop. (Endelman and Wagner.)

straining inward, work to an equilibrium, so that if either set of muscles is weak an abnormal development takes place.

Kirk says, "Like many other physiological developmental activities of the organism the process of dentition shows distinct evidences of being *rhythmical in character,* that is to say, there is a manifest period of functional activity during the time that certain teeth or groups of teeth are forming and erupting which is followed by a period of rest intervening previous to the eruption of the succeeding group.

THE DENTITIONAL EQUILIBRIUM (Figs. 26, 27, 28)

Brief consideration of the developmental activities concerned in the growth and eruption of the teeth will recall to your minds that in the normal

evolution of the denture there is maintained a harmonious correspondence between the additions by growth to the developing roots of the teeth and the process of absorption of the tissues overlying the tooth crown as eruption of the tooth proceeds. *This harmonious synchronism between root growth and tissue absorption is a delicately balanced mechanism, a sort of moving equilibrium, dependent for its stability upon the nutritional and physiologic balance of the entire infant organism.* We all know how easily the physiologic

Fig. 21.—Same stage of development as seen in the preceding illustration. The follicular sac which springs from the base of the dental papilla is seen surrounding the developing organ. *a*, Follicular wall; b, dental papilla; *c*, internal or ameloblastic layer. (Endelman and Wagner.)

balance of the infant may be disturbed especially during the teething period, the period of dentitional stress. Faulty hygiene, improper feeding, indigestion, physical irritation arising from improper clothing or abnormal temperature conditions, lack of sleep, etc., may so affect the growing organism during the teething process as to bring about inharmony between the root growth and absorption of the tissues overlying the tooth crown, thus causing a back-

ward pressure by the undeveloped root end upon the dentinal papilla with any or all of the succeeding phenomena of pathologic dentition as the result.

"While the *dentitional* reflexes are ordinarily spastic in expression, as in the case of acute vomiting caused by peripheral irritation of one of the

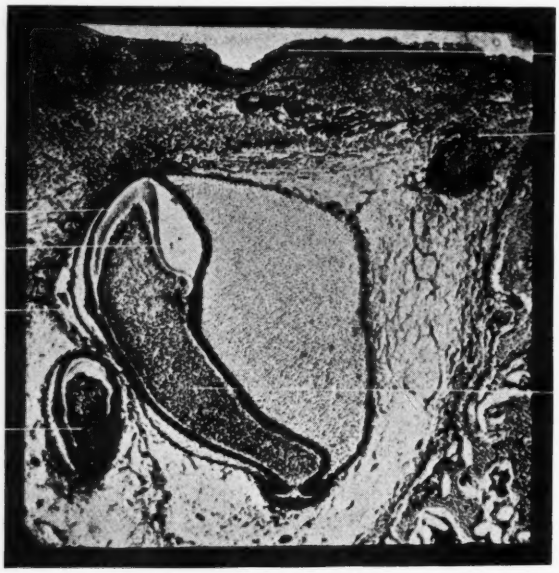


Fig. 22.—Development of deciduous incisor from human fetus. (After Gysi.)

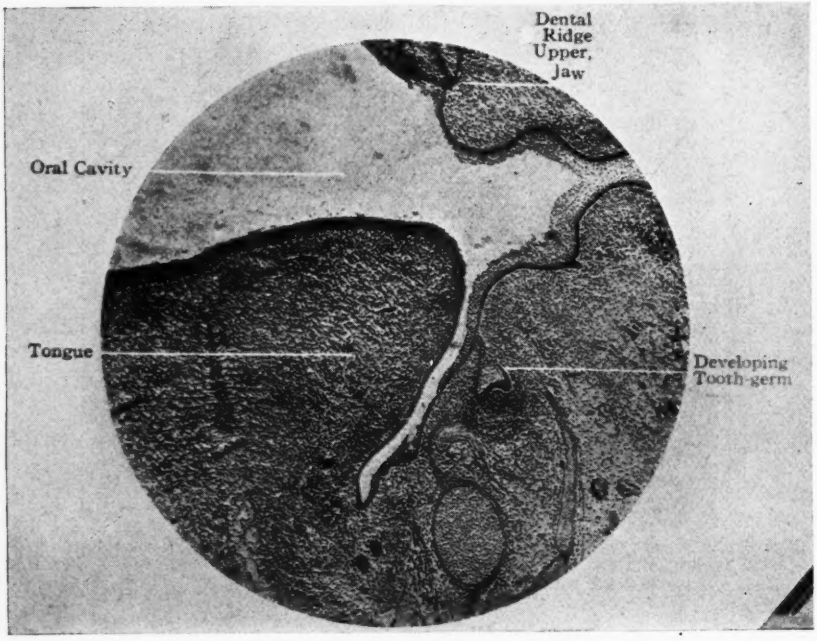


Fig. 23.—Section through the floor of the mouth of human embryo. Twelfth week. (Broomell and Fischelis.)

cranial nerves, their range is a wide one, including derangements of speech, hearing and of vision as seen in the many cases of strabismus among children of school age as well as chorea, epilepsy, dementia precox, intellectual dullness leading to retardation in education and in mental deficiency.

"When we consider the motor, sensory, sympathetic and special sense connections of the trigeminus, the wide scope and variety of the reflexes which may and do arise from continued physical irritation of its dental peripheral

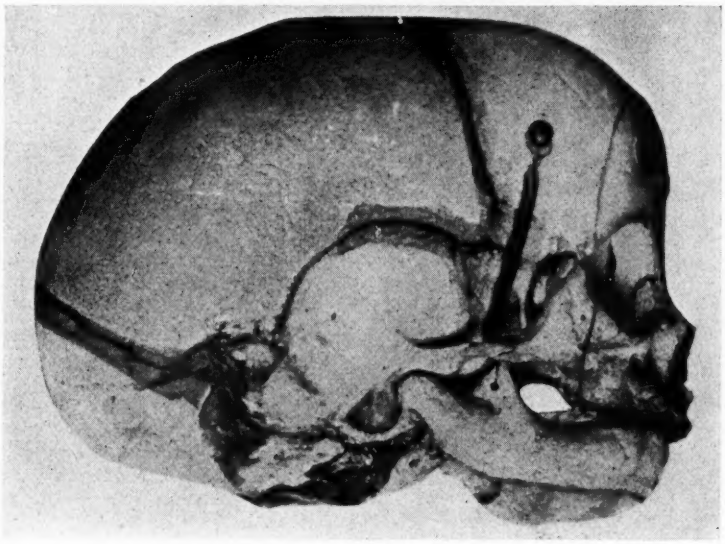


Fig. 24.—Side view of skull at birth. (Cryer.)

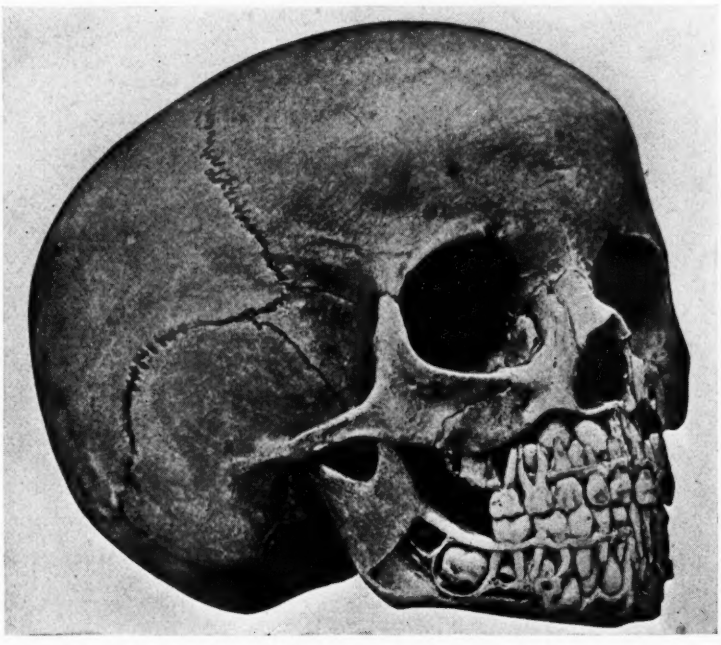


Fig. 25.—Skull of a child, aged about six years, showing all the deciduous teeth in position and the developing permanent teeth. (Cryer.)

terminals are easily understandable. It is observable that in the early phase of these slight continued irritations of the dental nerve terminals the reflexes are intermittent and functional, but after a time they become chronic and continuous."

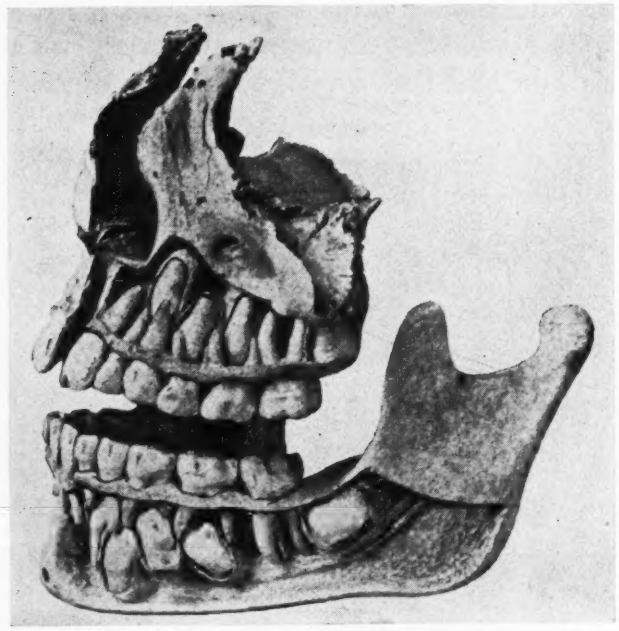


Fig. 26.—Side view of the upper and lower jaws of a child about seven or eight years of age, showing the deciduous teeth, the first molars, and the germs of other permanent teeth. (Cryer.)

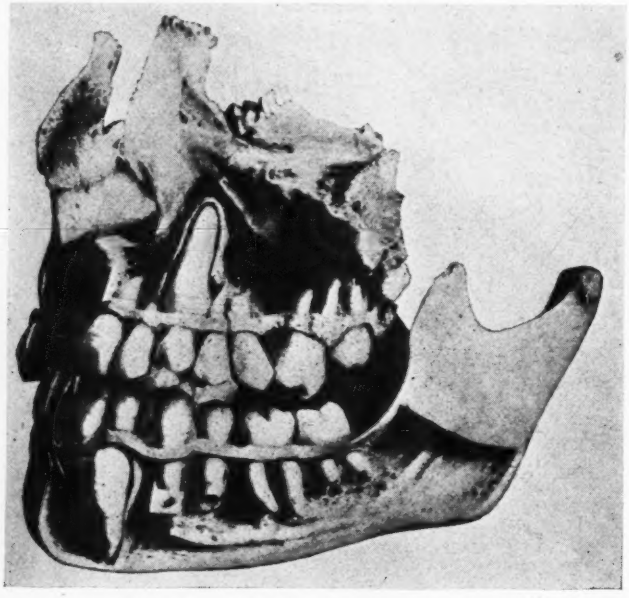


Fig. 27.—Side view of upper and lower jaws of a child about twelve or thirteen years of age. (Cryer.)

THE DENTAL TRANSITIONAL PERIOD

This period we shall arbitrarily call from five and a half to twelve years of age, and is the period of greatest dental anatomic and physiological activity and consequently of dentitional stress.

During this period a tremendous physical development usually takes place. Nature has worked out a very delicate equilibrium between erupting and shedding teeth.

Anywhere from five to seven years of age the first permanent molar erupts. It is not necessary to go into the function of this tooth. We already know that the mouth in a large degree is wrecked dentally speaking when this is lost.

During the fifth year a gradual development of the incisal area causes spaces to appear between the deciduous central incisors. If these spaces do not appear, there is usually not a proper development taking place. If a child's jaw was radiographed in the incisal area during this time the position of the centrals, laterals and cuspids would reveal a triangular arrangement with the centrals at the apex of the triangle, the laterals lower down and the cuspids forming the imaginary base line. The centrals transmitting force to the laterals and cuspids cause the widening and growth of the anterior portions of the face.

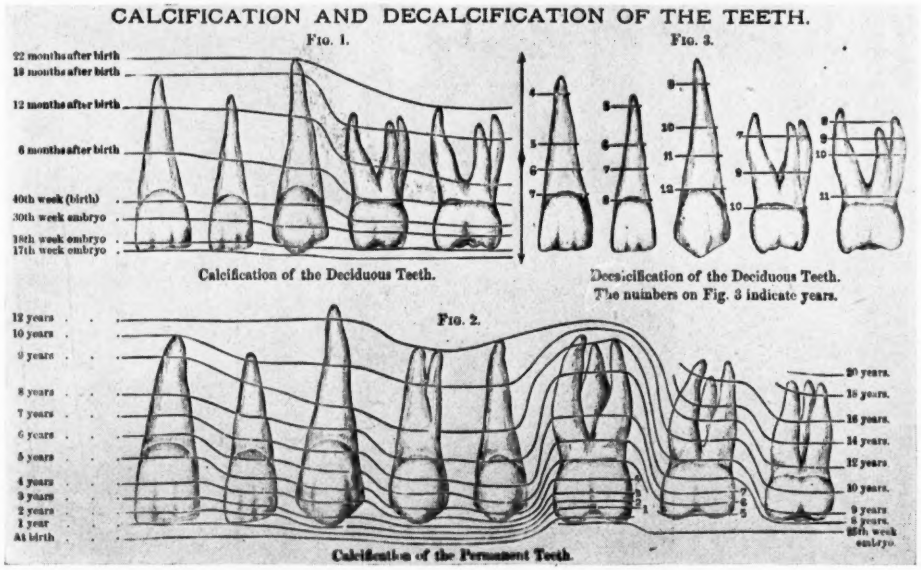


Fig. 28.—Calcification chart.

About eight years of age the jawbones begin to develop in their lateral divisions in a downward and forward direction. The premolar roots push the base portion of their crypts up until the malar part of the bone offers resistance. This resistance causes the premolars to exert pressure on the cuspid crypt in front and the first permanent molar. This causes the stimulated bone to grow.

PHENOMENA OF RESORPTION (Figs. 29, 30)

The phenomena of resorption as applied to growth and development is rather obscure, but there are some facts worth considering.

1. The tissue about to be resorbed though rich in cells, is very poor in nuclei.

2. Opposed to this we have the imposing wealth of nuclei in the germ and tooth sac.

3. During the process of resorption hyperemia is always present, whether the process is physiologic or pathologic.

4. It is not demonstrable what specific substance causes the dissolution of the mineral matter in order to make it fit for resorption.

5. It is assumed that the osteoclasts and giant cells carry a fluid which enables them to effect a preparation for resorption.

6. The circulatory system occupies the leading part in the process of resorption.

7. Resorption is dependent on the tooth sac to some degree.

8. Resorption may take place as a result of trophic disturbances, which increase with growth, bringing about a condition in the deciduous tooth region favorable to resorption.

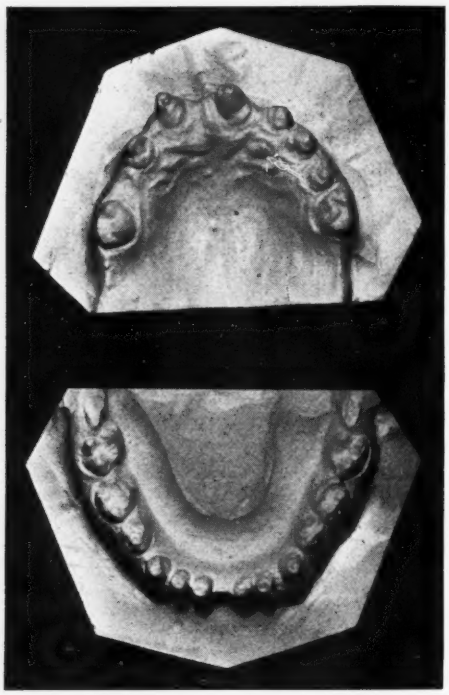


Fig. 29.—Boy fourteen years old. Cast shows upper peg-shaped centrals and lower first molars only permanent teeth. The x-ray shows the absence of any other permanent teeth.

BLACK'S RULE FOR RESORPTION OF DECIDUOUS ROOTS

1. In the absorption of the roots of the deciduous teeth the incisors begin, the central at four, the lateral five;

2. Skip a tooth and a number and the molars begin to be absorbed, the first at seven, the second at eight;

3. Skip back to the cuspid which begins to be absorbed at nine years.

GROWTH AND DEVELOPMENT (ONTOGENY)

Growth is one of the fundamental properties of living matter. It has been defined as "an increase in the volume of the living material." (Morgan.)

Fig. 30-*A*.

Fig. 30-*B*.

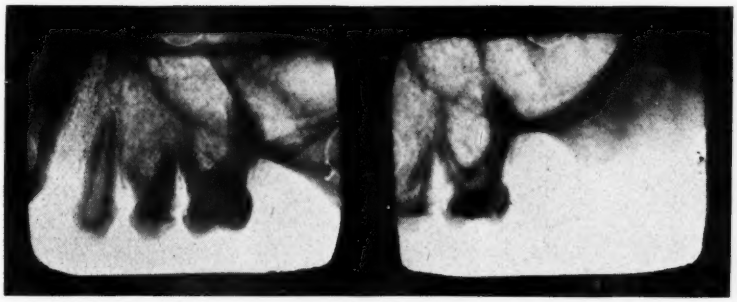


Fig. 30-*C*.

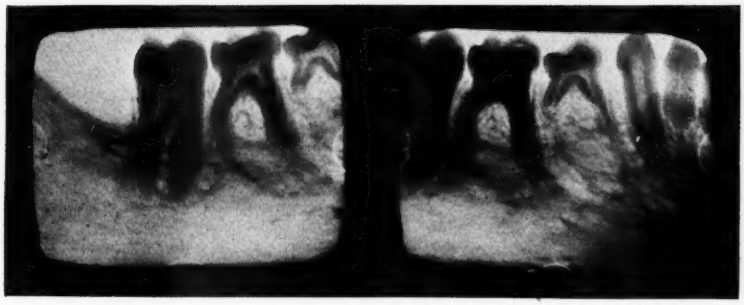


Fig. 30-*D*.

Fig. 30.—Radiographs of same case as shown in Fig. 29.

"Each animal, each plant, must have its individual beginning, its creation, and its individual development from this beginning to a full grown, completely developed condition. For no organism is born fully developed. Even the simplest organisms, the one-celled kinds, whose "creation" is accomplished simply by the splitting in two of a previously existing individual of their kind, are not produced full-fledged. They have at least to increase from half size to full size, that is, to grow, and there are very few if any of them that do not have to effect changes in their body structure during this period of growth; that is, they have to undergo some development. The beginning, then, is always from a previously existing organism, but how could it *always* have been?—and between this beginning and the normal

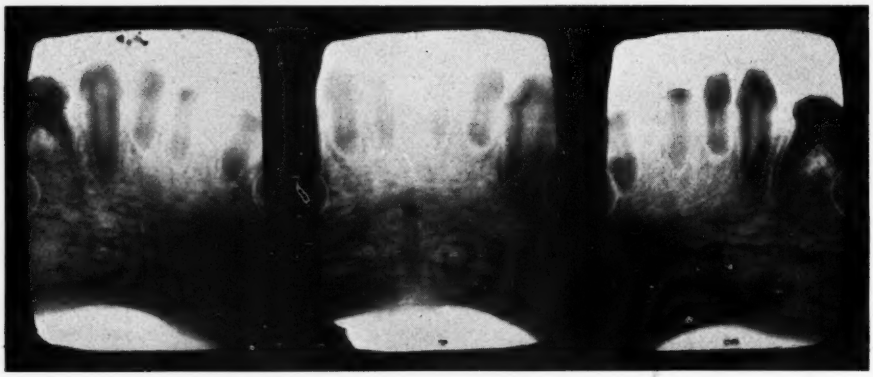


Fig. 30-*E.*

Fig. 30-*F.*

mature or full-fledged creature there has always to be some development. The beginning is called *generation;* the development, *ontogeny.*" (Jordan and Kellogg.)

The one outstanding characteristic of growth is noiselessness. In all evolutionary development, either in the animal or mineral kingdom, this is an outstanding phenomena.

It is manifestly impossible to give a short concise treatise on growth. Only a few notable points can be suggested. When it comes to natural and artificial selection, variation, mutations, heredity, etc., it would require volumes, and so I suggest a collateral study of this subject in books expressly devoted to this subject.

Rate of Growth. There is a variability in speed of development which is called "rate of growth."

Hellman states that "rate of growth is not uniformly proportionate or disproportionate with the length of the growth period. In the course of its

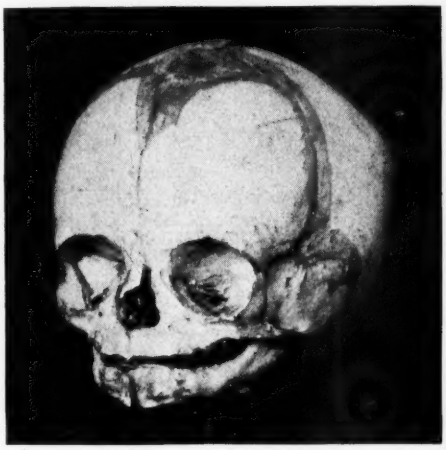


Fig. 31.—Skull of embryo. (Anatomical Department, College of Dentistry, U. S. C.)

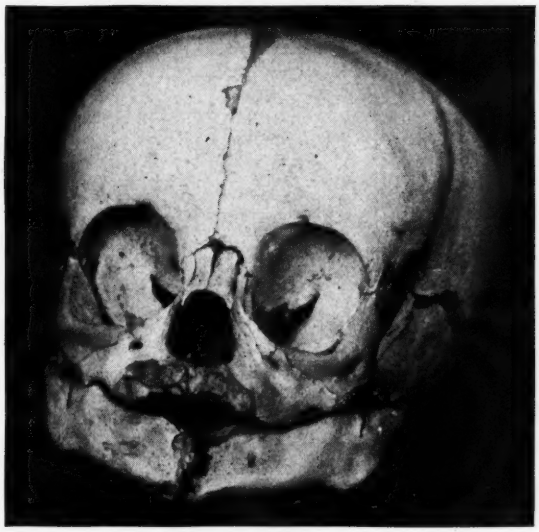


Fig. 32.—Skull of baby after birth. (Anatomical Department, College of Dentistry, U. S. C.)

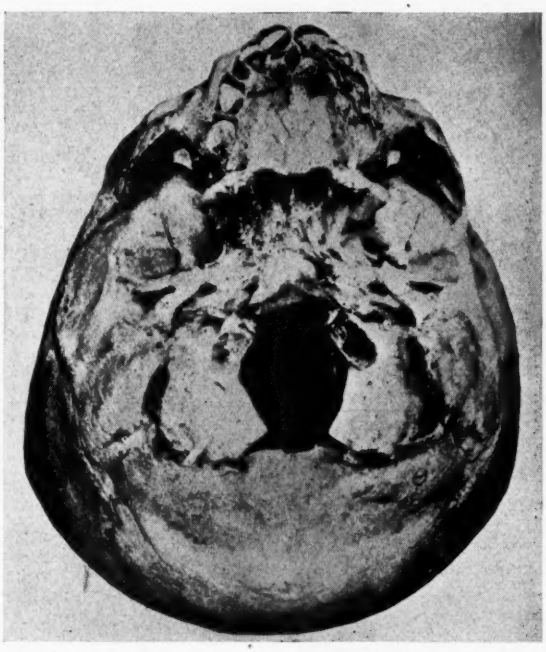


Fig. 33.—Under view of a child's skull with sutures radiating from the median suture toward the interspace between the teeth. (Cryer.)

manifestation it is also found that it increases and decreases in intensity. These increases and decreases of intensity are interpreted as *accelerations* and *retardations* of growth.

"The head reaches its adult size considerably earlier than the rest of the

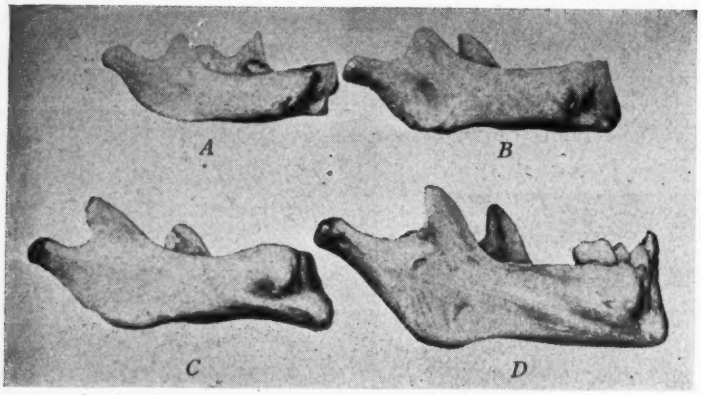


Fig. 34.—Four mandibles ranging from birth to eighteen months: *A*, at birth; *B*, at three months; *C*, at six months; *D*, at eighteen months. (Cryer.)

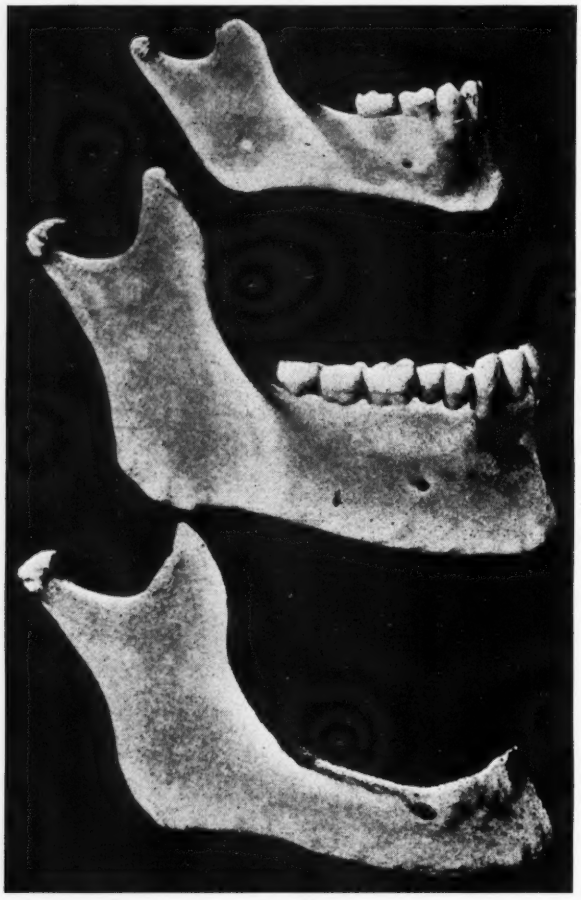


Fig. 35.—Chart showing the evolution and degeneracy of the mandible. (Broomell and Fischelis.)

individual. Its acceleration periods therefore are considerably in advance of that of any other part of the body. When the growth of the body is at the lowest ebb of retardation, the growth of the head is at its highest flow of acceleration.''

Various parts of the body have their periods of active growth at different times. Different organs depending on the physiologic age have their *acceleration periods.* The thymus has an early *retardation* of growth.

Hellman made a study of children from various classes and found that eruption and shedding periods of teeth differed. It is reported that in children of the South the transitional period appears earlier than in those of the North.

Again it may be pointed out that the rate of growth may differ between the two sides of the jaws. The teeth on one side may be lost earlier than those on the other.

Girls shed their teeth on an average of four and a half months earlier than boys, that is, their periods of growth differ from the boys'. Their periods of acceleration are earlier than boys'. There are so many interesting things to point out in the phenomena of growth and development, I respectfully suggest that the dentist review Jordan and Kellogg on ''Evolution and Animal Life.'' It will give him a better outlook on the biologic side of his profession.

(To be continued.)

TEACHING ORTHODONTIA IN DENTAL SCHOOLS*

By Dr. Guy S. Millberry, San Francisco, Calif.
Dean of the Dental Department University of California, San Francisco.

THE subject of teaching orthodontia has been foremost in the minds of dental educators for a number of years. The American Institute of Dental Teachers has for five years considered this subject, giving it a place of considerable importance in the programs, and there has been a wide diversity of opinion in the matter. We have to bear in mind that the whole state of dental, medical, engineering and scientific education and all humanistic studies is in a condition of flux. Chaos prevails over the world in this regard. Orthodontia occupies no different position in this regard than other departments.

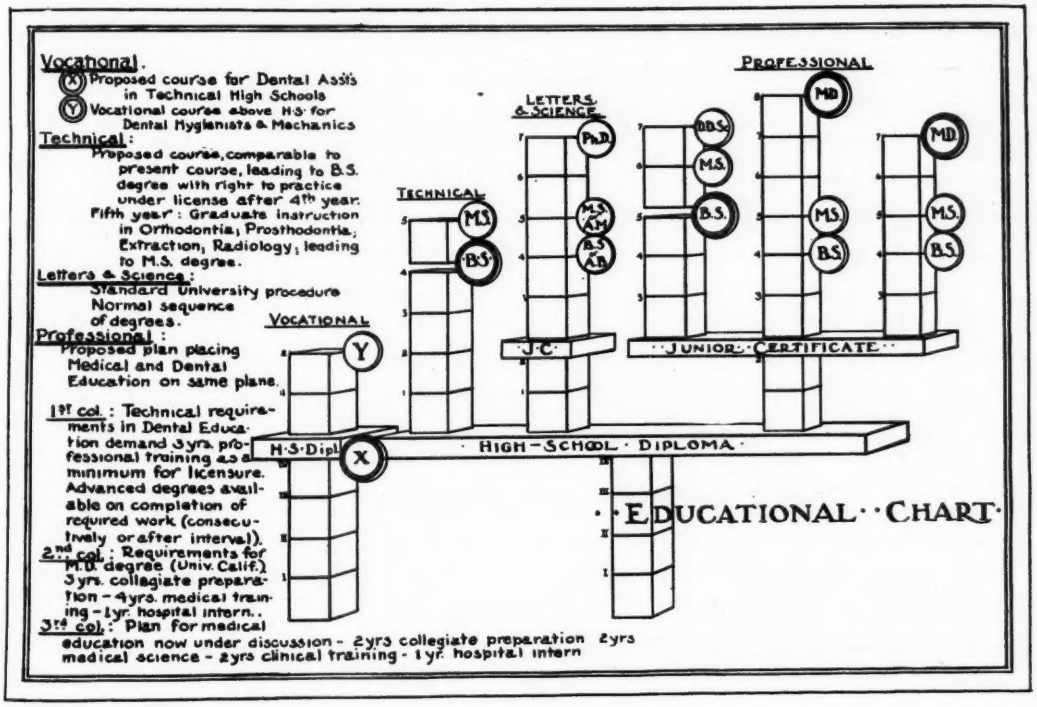
Some institutions have gone to five-year courses in dental education and expect to go to a six-year course. The educators have had no real opportunity to adjust themselves to the difference of opinion, or to determine whether a four-year course in dentistry was adequate when the five-year course began in 1921, or whether a five-year course will be adequate in 1926 when they propose to establish a six-year course. While universities have advanced the number of years in education in certain professional fields, there follows a diminution in students attending those schools. Columbia University was considered a few years ago as foremost in its mining and engineering departments. In 1922 there were but four graduates in mining engineering and two in civil engineering. They cannot meet the expectation of the country so far as engineering needs are concerned. In medicine we have a similar condition, where the medical schools have gone rapidly from a four-year course to one of eight or nine years, including interneship. Stanford and the University of California require eight years for a degree. Going rapidly from a four-year to an eight-year course in less than a decade has limited the enrollment of students so that today Stanford and the University of California are not supplying even the wastage in California. In 1919 there were 300 men who had given up professional practice for various reasons, death, leaving the state, discontinuances, etc., and only 60 were supplied by our two leading institutions, which means that 240 physicians would have to be added to our roll from other sources to make up the existing quota.

We are confronted in dentistry by the same problem, and orthodontia constitutes but one phase of the same thing. We find that orthodontia teaching itself has been modified materially in the last few years. Where the ordinary layman's concept has been simply mechanical work, or the movement of teeth, the concept of the teachers themselves has been largely changed

*Read before the Pacific Coast Society of Orthodontists, San Francisco, Calif., May 14-15, 1923.

to the biologic phase—toward preventive work. This change has come within a few years, and is being gradually introduced into college teaching. I believe our graduate courses in existing schools of orthodontia are not offering as much as is required to meet the newer concept of professional responsibility. If these courses are offering only mechanical principles, students cannot go out and practice orthodontia from the standpoint of the requirements of biology.

We must bear in mind that the product in orthodontia today—the men who are practicing the specialty today—are almost entirely the product of short courses in orthodontic instruction, extending over four weeks to two or three months. No schools have offered orthodontic instruction covering


Vocational.
(X) Proposed course for Dental Ass'ts in Technical High Schools
(Y) Vocational course above H.S. for Dental Hygienists & Mechanics
Technical:
Proposed course, comparable to present course, leading to B.S. degree with right to practice under license after 4th year.
Fifth year: Graduate instruction in Orthodontia; Prosthodontia; Extraction, Radiology; leading to M.S. degree.
Letters & Science:
Standard University procedure
Normal sequence of degrees.
Professional:
Proposed plan placing Medical and Dental Education on same plane.
1st col.: Technical requirements in Dental Education demand 3 yrs. professional training as a minimum for licensure. Advanced degrees available on completion of required work (consecutively or after interval).
2nd col.: Requirements for M.D. degree (Univ. Calif.) 3 yrs. collegiate preparation - 4 yrs. medical training - 1 yr. hospital intern.
3rd col.: Plan for medical education now under discussion - 2 yrs collegiate preparation 2 yrs medical science - 2 yrs clinical training - 1 yr. hospital intern
VOCATIONAL
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LETTERS & SCIENCE
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HIGH-SCHOOL DIPLOMA
EDUCATIONAL CHART

Fig. 1.

a period of one year except the Forsyth Dental Infirmary. I think you will agree with me that at least some of the teachers who have been giving these courses of short duration have made an extremely valuable contribution to the dental profession. Dr. Angle's work is a real heritage, and you will find among the men who have had his course, most of the leading orthodontists of the East as well as of the West, and while they may differ from him today, nevertheless, he has left a heritage to orthodontia that is unique and valuable. The short course has been the only thing available, and we are confronted annually with the young graduate who wants to go into the field of orthodontia, and we realize our institutions are not offering the instruction he should have before he engages in such practice. What shall be done with that man? Shall he go and study with an orthodontist, come back to the college clinics for his experience, or go to the short school course

for two months entailing an expenditure of from $200 to $1000—and if he completes that, is he fitted for the practice of orthodontia? We depend upon you largely for guidance and advice in this matter.

The deans of the various schools have taken different points of view regarding this question. Some have been inclined to leave this entirely to the orthodontists themselves, if they are interested in the teaching of their profession. The deans are less likely to say that they must include clinical teaching in orthodontia, because it is a revenue-producing factor in the schools. Teaching orthodontia in some schools at present is modified by the attitude of the deans who believe revenue is an essential thing. Thus, there is a wide divergence of opinion which has almost resulted in a form of classification of colleges. In many of the leading institutions the students have practically no participation in clinical work today; they are taught by observation. On the other hand, some dental schools are teaching orthodontia in the freshman year, and I cannot conceive of that kind of instruction as being adequate. The students are not in a position to understand or absorb it, and the little patients are not receiving the best of attention even though the direction of the course may be satisfactory. We have that problem before us—what shall we do next?

There has been divergence of opinion again regarding methods. We, in our department, (I may present it as a concept) have believed for some time past that orthodontic instruction should be graduate instruction. It should be builded upon the regular dental course, to say the least, during which time the student has had some technical training and some lecture instruction and some reading. That should be a prerequisite before entering upon the graduate instruction. Then he should spend at least a year in the study of orthodontics before he qualifies for his work. I have two suggestions: (1) He shall come back and register for a full year of instruction, taking a certain amount of advanced biology, getting it at the University at Berkeley possibly, more advanced histology, perhaps some anatomy and a certain amount of orthodontic technic. If permitted to do so (and he will be ere long) he can register for certain courses in the medical school, notably rhinology. Why should he not have some knowledge of the structures of interest to the rhinologist, which are so interrelated that they cannot be separated from his work? He probably will take a certain number of cases in clinical orthodontia, under the guidance of his instructors, and carry them through.

(2) He may have to do some work in teaching by virtue of the fact that teaching requires study. Thus he may be termed a "teaching fellow." Most of the men in the university, who after graduation with a bachelor's degree seek their doctorate in philosophy or science, are "teaching fellows." They work their way through, as it were, giving instruction in the lines of endeavor they are following. Thus, at the end of a year the student will have accomplished some work in orthodontia and some work in related subjects, and then he will perhaps be more proficient than he would be through any other method.

A man may not be in a position to give up a whole year of time for orthodontic instruction, and we have felt a short term might be offered, spreading it out over a period of the year. That candidate would come to us from a radius of one hundred miles on Monday morning (our instruction being given by the entire staff on Tuesday mornings now), to prepare himself for practice in orthodontia. By coming on Monday he may devote that day to the technical work on his cases, which is expected of him by the instructional staff. He is given a certain amount of reading to do and is responsible to the instructors for recitation or a discussion of that reading. He has the opportunity of conference with the various instructors. On Tuesday morning he sees all the work going on in the clinic, and he can take the regular lectures. Then he presents his clinical cases as he is carrying them on for criticism. That man devotes practically a day and a half a week for thirty-two weeks or about fifty full days to instruction. He has had plenty of opportunity between Tuesday afternoon or Wednesday morning and the following Monday to carry on his private dental practice and do such reading and technical work as may be required of him by the staff. He has a full year's contact and study on the subject without giving a full year's time.

I have never been wholly in sympathy with the short-term courses in orthodontia. I believe orthodontia to be the most valuable and important specialty in dentistry. I do not believe anatomic occlusion, removable bridge work, extraction or surgery are nearly so important as orthodontia. You are working in a wonderful field of prevention, and have the opportunity of helping the children. Therefore, we would shape our courses of instruction with the thought in mind that the children deserve the best we have in the field of prevention. Some of the men in the other institutions have differed with me in this point of view. At the American Institute in Montreal in January, 1922, we had a discussion or debate—three orthodontists and three other dental teachers engaged in the discussion without having any common ground for argument or agreement, and each presented his point of view regarding the teaching of orthodontia. The result was a wide divergence of views and we arrived nowhere. It became necessary to appoint a committee of orthodontists in attendance and they got together and decided it would be best to get the points of view from various parts of the United States as to methods of teaching orthodontia and outline something representative of the orthodontia point of view. Dr. LeRoy Johnson was appointed chairman of that committee; Dr. McCoy and some men from other points were included. That committee was to have made a report at the Omaha meeting. I was not in attendance and do not know what the report was. I do know, however, there was a general meeting called at Pennsylvania under Dr. Johnson. It is expected there will be a renewal of the conference annually.

We are open to suggestions, as I have told the dental profession many times in conference with them. Our teachers go out into these professional meetings and we profit by the ideas and suggestions, and where they are

practical and such as may be considered of university value, we incorporate them in our courses of instruction. It is a very inappropriate thing for us to say we are in advance of the profession. You will concede we are not. We depend on you, the leaders in our profession, to agree upon what we are to teach. Therefore, we must teach the basic elements to those coming to us for orthodontic instruction, and we must depend upon you for guidance in our growth. The same is true of the other departments in the field of dentistry. It is not a question of whether "commerce follows the flag" or whether "flag follows commerce," it is a question of cooperation.

I hope the time is not far distant when we can establish a graduate school in orthodontia. We have proposed a new idea with regard to dental instruction, i.e., that we present a four-year course of instruction equivalent to the present course modified progressively each year and at the completion of that course offer a bachelor's degree (B.S.) that will permit the practice of technical dentistry—placing of fillings, extraction of teeth, making of simple dentures, etc. Then building on that course other courses occupying a full year, including orthodontics, prosthodontia, crown and bridge work, etc., including special scientific work, which lead to the master's degree. Then for our doctorate, we will recommend that a man go to the university for two years and while there take certain courses that are basic in preparation for his medical sciences, as anatomy, pathology and physiology. In the third or fourth year, if he chooses orthodontia, he may take the subjects having a direct bearing on that subject, i.e., biology or some of the problems of physics. If he selects orthodontia, he should be guided into the courses that will make him competent. If prosthodontia is chosen he will be interested in physics and metallurgy. Thus, in seven years he should be trained as men in other courses leading to the doctor's degree are trained. I feel that our doctor of dental surgery should be trained in this manner. The plan has met with favorable consideration by the faculty and in the university, but the university authorities felt it would be too radical a change unless a number of the leading universities would adopt a similar plan.

This plan would provide the volume of adequately trained technical dentists necessary to meet the demand for routine service, and at the same time provide for advanced instruction in special fields or train men adequately for such special service as the profession demands now.

DISCUSSION

Dr. James D. McCoy.—Dr. Millberry's analysis of the problems which confront dental education and our particular field, has certainly proved enlightening. I think if any of us were asked to outline a course of study which would prove adequate to prepare a man for orthodontic practice, we would hesitate even to attempt it. The diversity of opinion in all quarters has been so great that we cannot but feel that we would be traveling over uncharted territory. However, I believe that from the general surveys of the situation, including the suggestions of Dr. Millberry, the time is approaching when we can at least lay down the fundamentals which should be acquired by every man seeking to give service in this field.

The instruction given the undergraduate in various dental schools has offered quite a variation, and even today I do not suppose there are six dental schools in the country

whose courses to the undergraduate are similar. They all differ in some degree. It would seem to me, from my experience in attempting to handle this subject in a dental school, that before we can do justice to the student in this regard, we will have to change our attitude toward the subject; we will have to give the matter an entirely different status in the dental curriculum. Roughly speaking, we can divide the dental curriculum into two classes, i. e., major subjects and minor subjects. Among the major subjects we would include operative and prosthetic dentistry, pathology, anatomy, etc. Included with the minor subjects there would be anesthesia, orthodontia, oral surgery, dieteties and hygiene, etc. If you take these two groups and compare them, you can see that you would designate them as the major subjects and the minor subjects in nearly all the schools. The student's love for any subject is determined largely by his familiarity with it. They say "Familiarity breeds contempt" but I do not think that holds true in dental studies, as the more thorough the student's knowledge of any subject, the better he will like it. So with orthodontia. I think its unpopularity with the average student has been due to the fact that he had a very incomplete conception of it. It would seem to me one of the first things we will have to do if orthodontia is to be given to the undergraduate in an efficient, practical and helpful manner, is to change our attitude toward the subject, making it more of a major subject. Even if that should be done, with the crowded condition of the dental curriculum, an inadequate amount of time could be allowed for it to prepare a man for the practice of orthodontia, but it will provide a foundation on which he can later build a fuller knowledge in the subject. In undergraduate instruction, there should be three divisions of the subject: First, the lecture work where the fundamentals should be given, and the student drilled in the related subjects. Second, he should have a certain amount of technical work, be taught the making of correct impressions, and plaster casts, as such instruction is not only essential to later work in orthodontia, but comprises a valuable part of his training in technic. Certain elementary forms of appliances should be made so as to develop technical skill and accuracy. Third, there should be clinical work in which the student acts as an observer. I do not believe in putting either senior or junior students on the active treatment of orthodontia cases. Exceptional students may perchance act as assistants and do it well, but I think clinical orthodontia bears much the same relation to the dental clinic as does oral surgery, and certainly we do not assign our senior students for cleft palate operations or other serious surgical procedures, as it would be unjust to the student and most unethical to the patient!

I was happy to hear Dr. Millberry express his ideas in regard to postgraduate work. The ideas he has given us, or similar plans, I think will provide the only suitable means whereby a man can be thoroughly trained to practice orthodontia. In other words, if he wants to be an orthodontist, he can go back for an extra year and act as a dental interne in orthodontia. There are several plans which could be worked out on the "interneship" plan which would prove far more helpful from a postgraduate standpoint than any of the so-called postgraduate courses given at present.

When young men ask me, "What course shall I take?" I have been rather loath to advise them, but I usually answered them in this way: "If I were a young man today and wanted to practice orthodontia, I would first spend a year studiously covering the literature of the subject, and during that year, I would attempt to handle very simple cases of orthodontia in my practice. At the end of that time, I would be able to determine from my studies and experience whether I wished to go further in this field. If I did, then I would certainly try to go into the clinic of some school and put in an interneship of a year doing clinical orthodontia, and taking courses in the various collateral subjects to amplify my clinical knowledge to make me more capable in the work."

Dr. Robert Dunn.—I was more than pleased to hear the views of Dr. Millberry in regard to the teaching of orthodontia. Most of you know the stand I have taken against the present methods of teaching this specialty, which are really inadequate and inefficient. One of the greatest specialties in dentistry is orthodontia. If you will look back over the past and see what we have accomplished for children and think what it means, you will appreciate what has been done in the way of preventive dentistry and then when you

see men entering the practice of orthodontia who know nothing about it, and who are looking at the subject entirely from a mercenary standpoint, you will see the seriousness of the situation. They are really ruining many mouths and upsetting all the ideas of preventive dentistry, and in a few short years their patients will be in the hands of the prosthodontist.

It has long been my idea that our universities should be the proper place for teaching orthodontia, and I have the same opinion of the short courses as Dr. McCoy, Dr. Millberry, and many of the rest of you. I have had in mind the thought that perhaps in as brief a time as possible the university might reorganize its courses so that orthodontia might be given as a major subject, so that the young man who will now enter the school and wishes to select orthodontia as his calling may take this special training along with his other dentistry, and at the time of his graduation will be more capable of taking up the practice of orthodontia than he would be by the present methods.

I like Dr. Millberry's idea of putting on another year and making orthodontia a special work, and would suggest that at this meeting a committee be appointed from this society to meet with Dr. Millberry and the professors of orthodontia in the University of California and endeavor to work out some plan whereby better facilities can be given those who desire to take up the practice of orthodontia. You all know there are certain institutions that promulgate ideas that are really vicious at the present time, and such should be eliminated as soon as possible. Efficient orthodontists are not made in six weeks or even in one year. You may expect to work ten years before you have learned how to carry a given case of orthodontia to a successful termination.

Dr. Guy S. Millberry (closing).—I hope you will discuss this among yourselves very liberally during this session so that we will have the benefit of your judgment and thoughts. I am sure we should be glad to have you appoint the committee referred to by Dr. Dunn. We try to do everything in a conservative and constructive way at the university. Just in line with the discussion of Dr. McCoy and Dr. Dunn, and especially referring to Dr. McCoy's statement that courses are dissimilar in many institutions, it is felt that the undergraduate courses are inadequate as conducted at present, and we must develop them more broadly or revise those courses. I am wholly in sympathy with the dissimilarity in teaching because I think you cannot place a standard form of instruction in the hands of forty-six different instructors in orthodontia and get the same results. If an instructor teaches biology, physics or dental anatomy, he should teach it in his own way, and he will stand out in the dental profession and in orthodontia as a good teacher if he is thus capable of successfully imparting the knowledge in his own way.

I am quite in sympathy with the idea that students should major in orthodontia, but I think it should be on the basis of graduate instruction. I am getting further away from the idea that the most important subjects are prosthetic and operative dentistry. I think orthodontia and preventive dentistry are of much greater importance.

Dr. McCoy mentioned the question of the popularity of the orthodontic courses in the schools. About the only time orthodontia is popular is after graduation when the men realize it is a very lucrative specialty.

As far as student observers are concerned, many of the clinical teachers feel the students should have some practice. The student observer must be an exceptional student before being allowed to do some clinical work, this to be determined on the basis of merit alone. How can it be done? Dr. Black advises me that in Chicago they are now inaugurating a new system of instruction in orthodontia, by appointing two full-time internes who must, of necessity, carry clinical cases through.

I am quite in sympathy with Dr. Dunn's views about short courses, but I realize that they have been the only available courses of instruction in the past. The men have profited by them because of their individual interest in the subject rather than from the merit of the courses. I am quite in accord with Dr. McCoy that present teaching methods are inadequate, and we hope our instruction will be more valuable in the future. We have had under way a reorganization plan for two years now. We have had to take care of the old cases that were on hand so that to that extent the new plan had not been fully

worked out. Now the instructors handle all the cases personally, the students participating only as office assistants, record keepers, or observers. Even the old cases are being handled in this way. The new cases are selected by each instructor for their teaching value and for diversity of type. The results have been highly satisfactory to both the patients and the school.

It has been a great pleasure for me to be with you here, even for a brief time, as it has been on former occasions. I hope the results of your session will be profitable to all of us.

MY METHOD OF A QUICK, CLEAN IMPRESSION FOR STUDY AND WORK MODELS, USING MODELING COMPOUND*

By Jesse F. Keeney, D.D.S., Quincy, Ill.

I THINK this method offers advantages in cases of children; it is a time saver and if properly worked gives a very accurate model.

I use my hand to test the heat of the water, and after selecting the tray with the same care as for plaster, I make a roll of the soft compound about the size of my finger and place it in the tray. None of the plaster should be placed on the palate part of the tray.

I then insert the tray and compound in the mouth and extending it back as far as necessary, I take pains to see that I force the compound up parallel to the long axis of the tooth. After I have the tray and contents up as far as necessary I start at the distobuccal left side and begin to press the compound to the buccal surfaces of the teeth with a rolling motion from the occlusal gingivally, working around the mouth in the same manner, always supporting the tray with the fingers of the other hand.

If the compound is allowed to cool at this stage, or rather just about the time it takes a clean imprint of the nail at some easy point to test, I remove the same and find that if I have been careful in the above technic a very nice and sharp impression of the case is obtained.

I know this plan is a time saver over plaster, and as time is money I think it will be used very much more if one will learn how to use it.

I have been using it for almost twelve years and the more I use it the more I can see that there is today a place in the orthodontic office for the keeping of modeling compound.

I do not claim any credit for this, but as far as I am concerned I give all the credit to Dr. Green. Many of us who live in the middle west have watched him many a time at the state and county meetings and his method of modeling compound impressions. With a little study and work I think there are several who will agree that it has its place in our work.

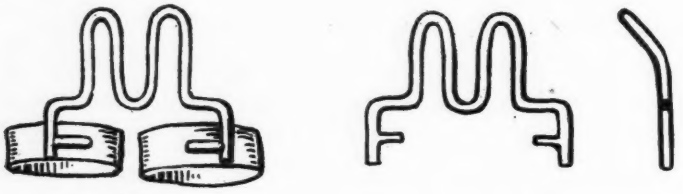
*Given before the American Society of Orthodontists, Chicago, Ill., April 9-11, 1923.

CORRECTION OF FRENUM-LABII BY WIRE EXTENSIONS FROM AN APPLIANCE ATTACHED TO THE TEETH*

By F. C. Rodgers, D.D.S., St. Louis, Mo.

THE following device was designed for the purpose of correcting an overdeveloped frenum-labii and separated centrals without resorting to a surgical operation and cumbersome appliances for bringing the teeth together. This appliance has been used in a number of cases with satisfactory results.

The appliance consists of a gold platinum wire bent first in the form of a U of sufficient width and depth to correspond with the size of the abnormal attachment of the overdeveloped frenum that is to be removed. The ends of the wire are then curved downward on themselves, and at the gingival margin of the gum are bent at right angles horizontal to the long axis of the



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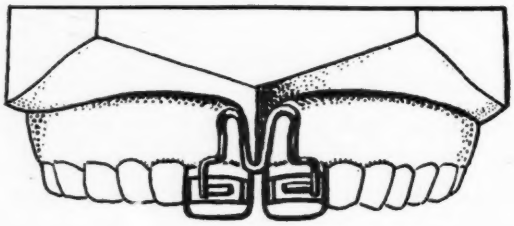

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teeth; at a point opposite the distal angle of the centrals the ends are again bent downward, forming a line with the long axis of the teeth, and should terminate just above the incisal edge of the centrals. The whole must be contoured to conform to the surface of the gum without actually touching it. (Figs. 1 and 2.)

The appliance is attached to the teeth by means of the pin and tube system. Plain bands, to which horizontal tubes are soldered, are cemented to the centrals. Pins to fit the tubes are soldered to the appliance one-sixteenth of an inch from the ends and inserted into the tubes from the

*Given before the American Society of Orthodontists, Chicago, Ill., April 9-11, 1923.

distal side, thereby developing spring pressure, which causes a mesial bodily movement of the teeth. (Fig. 3.)

For adjusting the appliance, the loop forming the open space in the U is closed by means of pinching it together with a plier. This will impinge on the fibers of the frenum, cutting off the blood supply, and thereby producing a strangulation, followed by a mild form of sloughing of the frenum attachment. At the same time the centrals are brought closer together, and the fibers between the teeth are also eliminated by pressure strangulation. The adjustment can be repeated as often as necessary, and when the treatment is completed the appliance may be worn indefinitely as a retainer, and for the purpose of preventing a reunion of the frenum.

DEPARTMENT OF
ORTHODONTIC TECHNIC

Edited By
H. C. Pollock, D.D.S., St. Louis, Mo.

ELEMENTARY ORTHODONTIC TECHNIC

By H. C. Pollock, D.D.S., St. Louis, Mo.

(Continued from January)

A Fixed Removable Appliance

PLAINLY in referring to the two great groups of orthodontic appliances, the fixed type as distinguished from the removable type, the former, cemented to place, is outstanding in present day usage as well as in popularity. As has often been mentioned heretofore in these pages, the practice of many orthodontists taken as a barometer must provide as convincing evidence as is available regarding the relative merits of devices for moving teeth.

Nevertheless, there are some principles of mechanics, as exemplified in types of removable appliances, particularly the Jackson, which have not been advocated in conjunction with the fixed type, and which have been pointed out as highly desirable features. For instance, in Fig. 44 (upper) is shown the older but formerly popular type of fixed labial arch wire. It is presumed here, by way of illustration only, that the labial arch wire is a spring making an effort to release itself, though securely held down by being ligated to the teeth. In the event the ligatures on the teeth were released the arch wire, its elasticity being sufficient, would take the position as indicated in line, *A, B, C, D.* In taking its position in line *A, B, C, D,* the distal end of the leg of the arch wire would describe arc *A.*

It is obvious then, that if the labial arch wire were allowed to pursue the logical and natural inclination of its elasticity, while attached to the buccal teeth without other foreign manipulation or maneuvering, the dental arch would not be expanded architecturally as desired. It is plain the buccal movement in the first molar region would be much greater than, for instance, would be the movement in the first premolar region.

In the lower illustration, Fig. 44 (The Jackson removable appliance) it is assumed also that this appliance is a spring, making an effort to release itself resisted, however, by the teeth. On account of the double curve of

design of the lingual base wire it can be seen that the mechanical effect on the movement of the teeth, as compared to the case in the upper illustration, is reversed. If the base wire were allowed to exert itself to the limit without outside interference or manipulation, the central incisor would describe the greatest movement as far as distance is concerned and the molar the least.

Inasmuch as many dental arches which require lateral expansion demand more width for correction in the premolar region than in the molar region, it is reasonable to suppose that this particular mechanical principle of the removable type of device is very much to be desired in moving teeth. By

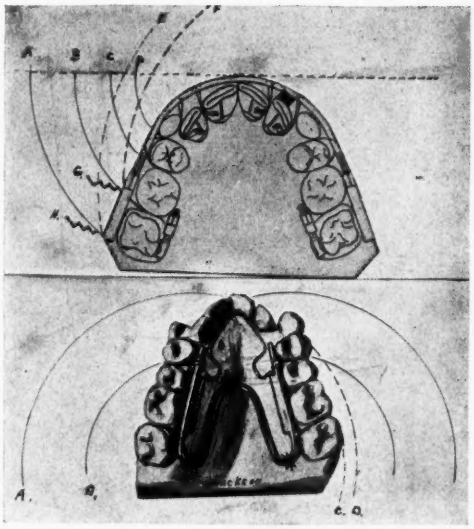


Fig. 44.—(Pullen.) Upper. Original base metal labial arch wire illustrating mechanical features and principles of direction of energy to the teeth (see text).

Lower. Jackson removable appliance illustrating method of applying pressure for lateral expansion of maxillary arch, as contrasted to upper illustration or outside labial arch wire. The double loop principle of base wire is shown.

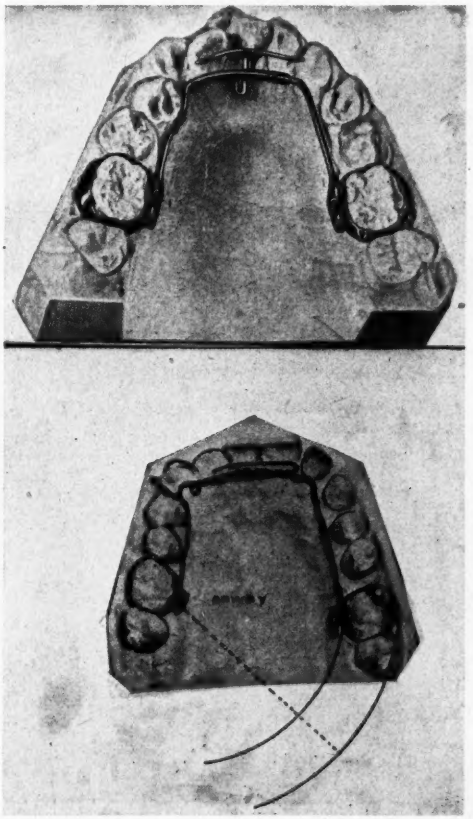


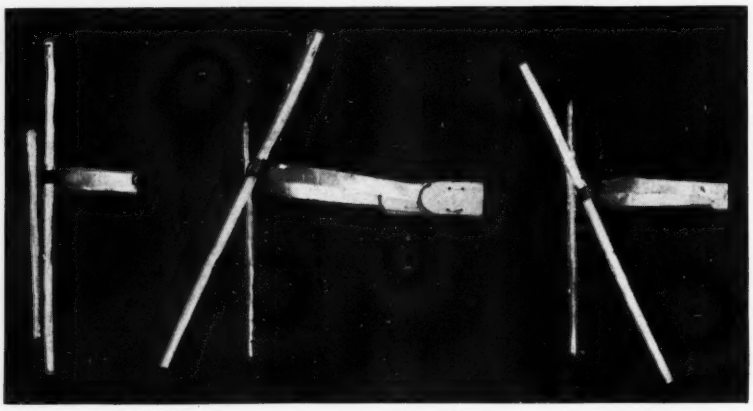
Fig. 45.—Upper. Lingual arch wire with lingual lock attachments on the molars. Pressure applied to lingual surfaces of anterior teeth by means of finger spring in turn makes a lever out of base lingual wire.

Lower. (Dewey.) Backing off of molar anchorage using lingual wire.

following the line "B" in the lower illustration it can easily be detected that the influence from the proper direction is here exerted upon the premolar region. In following the technical instructions of Jackson and Eby in the manipulation of this type of appliance, (Fig. 44, lower) it will be noted that distributing energy in the direction desired by the bending of this base wire is of a highly technical nature, and must be done with care and precision, otherwise the effect on tooth movement is entirely speculative.

Referring next to Fig. 45 (upper), showing lingual appliance with lingual locks, it will be noted that the same mechanical principle is involved as in the first appliance under consideration, the labial wire (Fig. 44, upper) in that it is also a spring trying to release itself, and unless manipulated by wire bending the point of greatest expansion would be gained in the molar region. Again with finger springs resting in contact with the lingual surfaces of the incisors exerting pressure thereon, it is obvious that there is exerted a very marked energy of the lingual arch wire in the distal direction of the first molars. In the lower illustration, (Fig. 45) this tendency and result may be observed in the backing off, as it were, of the first molar on the one side. In other words, anchorage has been lost as a result of reciprocated reaction in the distal direction of the first molar.

The lingual arch in this case, in attempting to release itself, has found the point of least resistance at the molar anchorage; accordingly it has spent its effort at this point with little if any action in the incisor region. Again,



A *B* *C*

Fig. 46.—Illustrating effect of tongue energy as applied to a flat or ribbon labial wire and its effect as applied to anterior and to posterior teeth during treatment, and its possibilities of anchorage for reciprocation of stresses.

as a result of the finger spring leaning against the incisal surfaces of the incisor teeth there has been a pushing upward of the lingual arch, in turn making of it a lever, with consequent tipping of the molar teeth as well.

Again referring to the principles as exemplified in the ribbon labial arch wire, heretofore considered in these pages, and the possibilities of stationary anchorage applied to anterior teeth as well as the direct control of root movement of the anterior teeth, a rather crude but practical illustration is shown in Fig. 46. An orange wood stick has been fixed to a wide metal ribbon by a fixed and immovable attachment. If no torque whatsoever is placed in the flat ribbon the orange wood stick remains in an upright position and serves as a stable anchorage to the flat ribbon. Fig. 46 (A). However, if the ribbon is torqued or twisted and then the ends of the ribbon forced into a vise grip representing buccal tubes, the torque in the ribbon, again making an effort to release itself, will cause the orange wood stick to take a position as indicated in Fig. 46 (B). Furthermore, if the ribbon is then torqued or

twisted in the opposite direction and forced into the vise attachments the orange wood stick will assume the position indicated in Fig. 46 (C). All indicate direction in which energy may be applied to the anterior teeth, provided anchorage of the molar or anchor teeth is entirely stationary and in

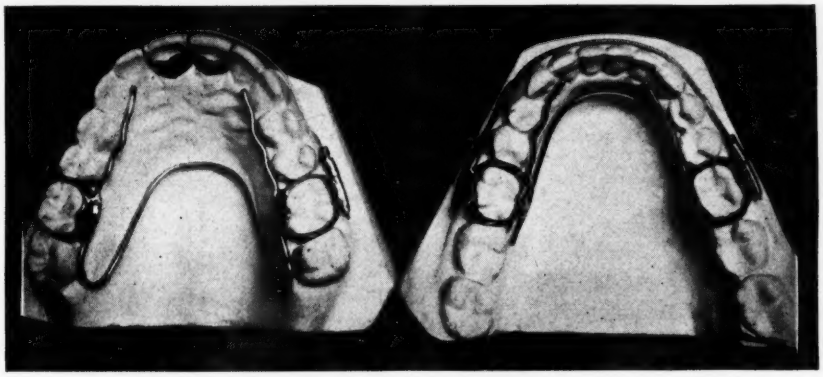


Fig. 47.—A fixed removable appliance cemented to place with temporary cement and removed entirely at will by the operator. However, it cannot be removed by the patient.

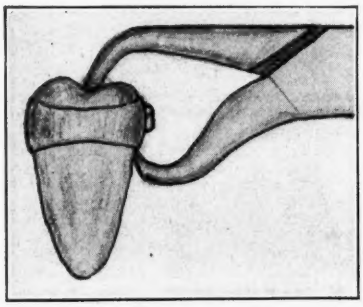


Fig. 48.—(Pullen.) Pullen band-removing pliers quite convenient for snapping off fixed removable appliance.

Fig. 49.—Showing possibilities of easy but effective widening of the maxillary arch by means of a fixed removable appliance as discussed in text, and by utilizing the anterior teeth as anchorage as well.

addition does not give way under slight stress or influence of the torque in the flat labial wire.

This leads to the conclusion that regarding the features exemplified in the removable appliance (Fig. 44, lower) if expansion can be secured as

manifest in this device without at the same time depending on a removable appliance; if the lingual arch features of finger springs and stabilized molar anchorage (Fig. 45) can be utilized, at the same time securing a firmer and more substantial attachment to the entire dental arch; if the desirable features of the ribbon arch technic as exemplified in Fig. 46, at the same time securing stabilized molar anchorage, can all be found in one appliance, that ap-

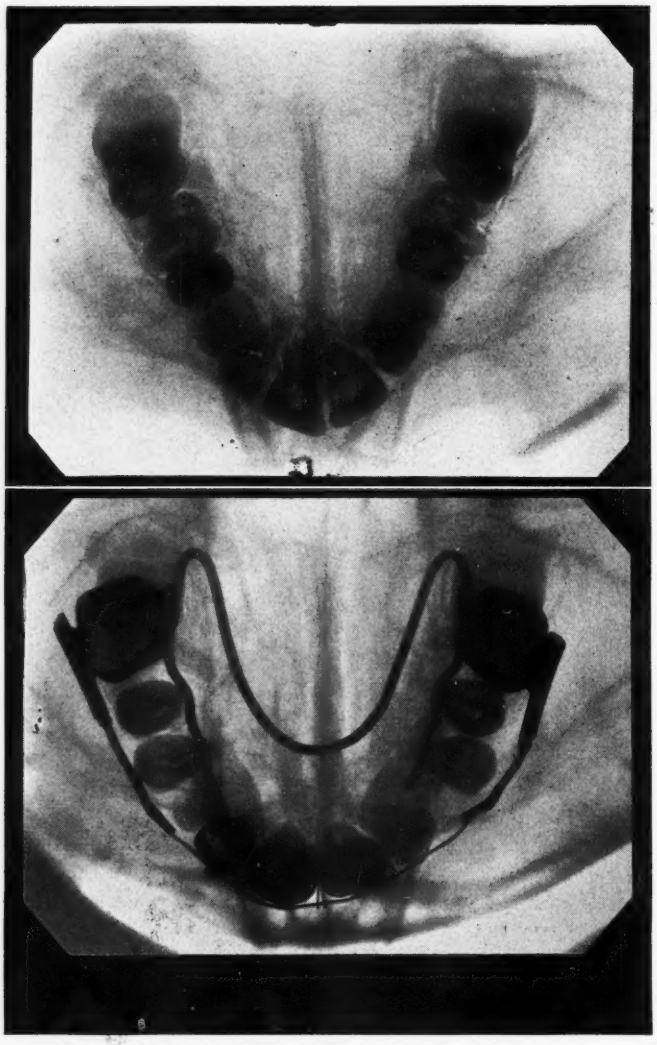


Fig. 50.—Upper. (Original) X-ray of maxillary arch.
Lower. After 6 months' widening process using fixed removable appliance. (Case of Dr. J. H. Williams.) (Simpson.)

pliance is surely to be desired, provided disadvantages are not encountered to offset the many advantages claimed for it.

In Fig. 47 is shown what may be called a fixed removable appliance. Fixed, because it is cemented to place by a temporary cement insofar as the anchor bands are concerned, though it may be quickly and easily removed by the operator at will by snapping off with band removing pliers; fixed furthermore, as result of secure attachment to the anterior teeth by means

of the Angle ribbon and brackets which may also be removed by the operator but not by the patient. Removable, because it may be quickly removed by the operator, and the lingual vise wire adjusted, similar to the technic employed in the Jackson removable; removable also, because the same prophylactic care may be given the mouth and tissues when desired as is possible with the usual removable type of appliance. For these reasons, it is both temporarily fixed and at the same time removable.

Materials Used.—The anchor bands are made of a hard stiff material of .008 thickness in order that they may be easily removed as indicated, and at the same time will not be mutilated or distorted in the process. If bands are well fitted to the teeth, soft gutta percha or soft temporary cement may be used for attachment to the molar teeth.

The base wire is made of 18 karat eighteen gauge white gold wire, soldered direct to the molar bands, thus providing a well stabilized molar anchorage. Equally as efficient is monel base wire of 16 gauge which will not lose its elasticity in soldering with silver solder when used in a gauge as large as 16 B & S. The molar bands should be sufficiently stiff in order that there be no flexing of the band material, as this will eliminate the stability of the appliance as a working unit.

Labial Arch Wire.—Regular Angle ribbon arch wire is used and may be supplemented by small round wire as desired. It is advocated by some during the early weeks of treatment.

Technic of Construction.—(1) Molar bands fitted directly in the mouth, bracket bands being fitted in like manner; (2) impressions taken with bands in place in modeling compound and impressions poured in artificial stone; (3) remainder of appliance constructed entirely over stone model. For a molar band removing plier the Pullen Band Remover is suggested. (Fig. 48.)

This type of appliance has been found to be particularly and unusually adaptable in those types of cases in which considerable lateral width is to be desired. As to the possibilities of treatment and results in lateral width, in Fig. 49 will be noted an extraordinary amount of lateral width which has been secured in a typical case of Class II Division 1. Gaining a considerable amount of width and retaining it, expedites and simplifies the retention of the anterior teeth in normal occlusion. Another case which may be noted is shown in Fig. 50, a typical case of expansion of impacted canine teeth. While this expansion has been entirely too vigorous and rapid, causing loss of anchorage of the molar teeth, particularly on one side, the possibilities of the efficacy of such a device are clearly demonstrated. In this particular type of malocclusion, by utilizing the possibility of width development as exemplified in the principles of the Jackson appliance, and employing this in conjunction with the root moving possibilities and anchorage of the Angle ribbon arch, it may easily be seen that the potentialities of such a device are not without some attraction.

(To be continued.)

DEPARTMENT OF DENTAL AND ORAL RADIOGRAPHY

Edited By

Clarence O. Simpson, M.D., D.D.S., and Howard R. Raper, D.D.S.

USES AND ABUSES OF RADIOLOGY IN DENTAL PRACTICE*

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RADIOLOGY is a science of great aid in diagnosis but it has been most shamefully abused and misinterpreted, in dental practice. Radiology is both an art and a science. The exactness of penetration and shadow reproduction of a part of the human body, by means of the roentgen rays upon a sensitive film, is an art. The correct interpretation of the light and dark shadows produced is a science. This, to my mind is a good definition for radiology. Is a definition sufficient to procure results? In order to produce a good radiogram there are certain essential factors to be considered which are as follows: Type of machine, tube, sparkgap, target distance, plate or film used, time of exposure, anatomic structures, screens, correct angling of the directed rays, in order neither to elongate nor foreshorten, and last but not least, the correct developing. The comparative sharpness and detail of the contiguous tissues may be clearly brought out by paying attention to the various factors named.

Granting that the aforestated facts are carried out in every detail, which gives us as nearly perfect a radiogram as can be obtained; is it sufficient for an operator to proceed with the operation? Most emphatically not. We still have a most important point to consider, and that is the correct interpretation of the radiogram, which makes the diagnosis complete.

The technic of radiography is easily mastered, but the correct interpretation of the light and dark shadows thereon, is not as easily acquired, unless one has a fairly good knowledge of the anatomy, physiology and pathology.

In order to detect the abnormal it is essential to understand the normal and thereby form and retain an indelible impression of the normal tissue and relation. By comparison only can we differentiate between the normal

*Read before the Borough Park Dental League, January 21, 1924.

and the abnormal, thus developing a fair understanding of radiographic interpretation.

It is a known fact that radiography alone is insufficient for a diagnosis and is an aid only to the clinical findings, making them complete. Let us consider what the roentgen rays reveal. They show a radiolucency or a radiopacity, and each is anatomic or pathologic. The mental, anterior and posterior palatine foraminae, the haversian canals and canaliculi, the maxillary and frontal sinuses, etc., are typical of anatomic radiolucency. Irritating areas caused by ill fitting crowns, pyorrhetic pockets, alveolar absorption, granulomatous areas and cystic degenerations are typical of pathologic radiolucency. The internal and external oblique lines, mental tubercles, broken roots and impacted teeth, are examples of anatomic radiopacity, even though the latter conditions may be brought about by pathologic interference. Hypercementosis, hyperosteosis, pulp stones, secondary dentine, etc. are typical pathologic radiopacities. How are these characteristic conditions produced upon the film. The shadows, produced by the rays, vary to the amount of resistance offered to their penetration between the tube and the film. Such resistance depends upon the tissue density, of which we have three types. First, the least dense as connective, fibrous and areolar tissues and vascular structures; second, the muscle and cartilaginous tissues; third, the most dense bone and foreign bodies. The rays, therefore, vary in penetration in ratio to the density of resistance; in other words, the lesser the tissue density, the stronger the penetration, producing a darker shadow upon the film, or the greater the tissue density, the less the penetration, producing a lighter shadow. With this in mind and the thorough understanding of the anatomic and physiologic relationship of the tissues taken as a standard, it makes it comparatively easy to differentiate the abnormal or pathologic from the normal.

Pathologic conditions, whether chemical, mechanical, traumatic or bacteriologic in origin, have the tendency of breaking down the surrounding tissues, reducing both their vitality and density, thus permitting a greater volume of ray penetration, creating a darker shadow upon the film, which is interpreted as a rarefied or radiolucent area. Pathologic radiopacity, however, is produced by a constant irritation upon the tissues, causing a thickening or an additional deposition of lime salts, thereby increasing its density to ray penetration, thus creating a lighter shadow. Some operators are under an erroneous impression, that the radiogram will show up almost every abnormal condition; it does not. The intent of part of this paper is to eradicate such an impression and to make it clear as to what and what not the rays do reveal. The rays reveal the following: Complete and incomplete root canal fillings, cavities in teeth, fractured roots, ill fitting crowns, overhanging filling materials, alveolar absorption, pulp stones, necrotic and fractured bone, impacted or unerupted teeth, hypercementomas, hyperosteomas, foreign bodies, rarefactions, cysts and tumors.

The rays do not show the presence of pus, inflammations, infections, vital or nonvital pulps, pericementitis or pulpitis, etc.

Just because an overanxious salesman induces you to purchase an x-ray machine and gives you several demonstrations on how to operate it, do not be under the impression that you have acquired all the technical knowledge that is sufficient for radiographic diagnosis. On the other hand, because an x-ray commercial laboratory sends you, as I call it, a "canned diagnosis," do not believe that you are fully competent and qualified to render the best of services to your patients. Many general conditions, which are the result of oral foci of infection, may be avoided by timely eradication, if only a correct radiographic interpretation and diagnosis is given.

Several cases were brought to my attention, where the laboratory "checked" diagnosis of conditions that were not present, which caused a good deal of embarrassment to operator and untold suffering to the patient. I will cite three cases which I vividly recall. In one case the referring dentist was informed that the patient had an impacted maxillary left third molar, upon which diagnosis the operator proceeded to attempt the removal of the offending member and after a diligent exploration of the area found to his amazement no impacted tooth present, yet the diagnosis called for an impaction on the left side. What has become of it? The patient was brought down to my office for a consultation. I examined the patient both clinically and radiographically and pointed out to the doctor, who was present, that the impaction was on the right side and not on the left. He was fully convinced of his error, when I removed the maxillary right third molar. The second case was that of a young man, of about twenty-six years of age, who has been suffering and complaining of severe pains, about the right parietal region of the head. Upon the advice of a physician he visited his dentist, who in turn sent him to an x-ray laboratory for a radiographic diagnosis, which came back negative. The patient, presumably satisfied there was nothing of dental origin that was the cause of his suffering, returned again to his physician in further quest for relief. His physician referred him to my office for a complete radiographic diagnosis, and it may surprise you to learn, that I not only found several pulpless and rarefied teeth, but also an impacted, unerupted canine on the right side. I subsequently removed the impaction and am more than gratified to state that the pain has gradually minimized and after two months totally disappeared. The third case is of a man who was suffering agonizing pain about the left parietal region for about seventeen years. This patient has visited six dentists without any relief; the seventh one, (who happens to be present this evening,) radiographed his entire mouth and found an impacted, unerupted canine on the left side. I removed the impaction and the patient's condition has wholly improved.

I could go on relating to you many other cases which have been overlooked and neglected, due to nothing but incorrect diagnosis. Do you realize the peculiar and perplexed positions in which we are placed when faced with a situation where the operator has made mistakes? We have to exonerate him, for otherwise suit is brought against him and I am often called upon to give testimony for the defendant in the court of justice. A physician "buries" his mistakes, ours are in everybody's mouth.

The medical profession has for many years looked upon dentistry as no more than a mere mechanical profession, but were ultimately convinced to the contrary, and now realize that dental surgery is a specialized branch of medicine and equally as important. The theory of oral foci of infection has been accepted by our medical brethren, and men like Mayo, Rosenow and others have done a good deal of research and championed its relative importance to systemic disease and eradication thereof. A good many, however, have greatly abused that theory and very often directed, if not ordered, the wholesale extraction of teeth, without due cause or adequate reason, but just merely to shirk the cloak of responsibility or as a subterfuge.

Personally, I do not blame the medical men for the condition, which is gaining alarming proportions. I do, however, blame the average general dental practitioners, for if they were able to correctly diagnose the cases as they are presented to them they would not only refuse to abide by the medical men's orders, but emphatically resent them, on the ground of their convictions based upon a positive diagnosis. Most dentists do not realize the value nor do they fully understand the x-ray interpretation and its fundamentals, giving the physician not only the opportunity of losing his confidence in oral diagnosis, but also permitting him to gain the ground upon which he can assume a Czar-like attitude, to dictate to us imperatively, for procedures in a field wholly strange to him.

In conclusion, I wish to lay emphatic stress upon the following: Do not purchase an x-ray machine, unless you have mastered the art of radiography and received intensive training in the science thereof, for as I pointed out the science of interpretation is of the utmost importance. Do not send patients to a commercial laboratory, for the following reasons: First, you encourage their existence in the same manner as those who encourage the illegal practice of dentistry; second, the technician or office girl, who checks up on the diagnosis knows nothing of the anatomic or pathologic relationship of the tissues, upon which a correct diagnosis can be based; third, the patients do not receive any clinical examinations (for in face of the law, such examinations shall not be administered by those who are not legally entitled to do so), in order to compare and check up on the radiographic findings.

The x-ray is a most valuable adjunct to the dental armamentarium, and should not be abused as it unfortunately is, but should be treated with the most tender care for the incomparable aid and assistance it is in our work.

It was with the aforementioned in mind, that, I say, in my opinion, radiology is most abused. If I have accomplished nothing more than to clarify certain doubts in your minds and caused you to reflect upon the past, with certain resolutions as to the future, so that humanity at large may be benefited thereby, and we profit by the folly of our own errors, I will feel greatly rewarded.

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DISCUSSION

Dr. Leo Hermann.—The essayist succeeded in his short talk on radiodontia to give a pretty fair outline of this vital subject. I hope he has stimulated you to further investigations and further study in radiography. It is futile to expect one to be able to cover this entire question at a society meeting.

The science of radiodontia is comparatively young, and is still in process of development. New problems present themselves daily, a fact that must be recognized and therefore faced with caution. It is most urgent for an early recognition and diagnosis of a disease to utilize *all* means at our disposal. These means are (1) clinical; (2) chemical and bacteriologic; and (3) radiographic. Periodic clinical examinations of patients are generally very valuable, yet if one relies on this form of examination only, he may be led to false conclusions. Examination of saliva, urine and blood is very essential at times, and when omitted the diagnosis is often only problematic, even though all other means were employed. To illustrate this point, let us take a case where after an extraction the alveolar socket does not respond to rapid healing. Clinically the case appears normal but the patient returns with complaints. The situation is unpleasant, especially when the frequent visitor recalls having had an extraction years ago with no postoperative complications. A radiogram in this case may disclose a slight speculum of the alveola in the socket, or a sharp edge of the alveola. Frequently surgical interference may improve the condition, but occasionally it may be of no consequence at all. As you see, you already have employed your clinical and radiographic experience but have found them wanting. What should be done next? A bacteriological examination of the patient's urine, and if this proves negative, a blood examination should be made. Of what use is a radiographic examination by a layman? Usually it is interpreted or misinterpreted by a man who has very little knowledge of radiography, and no knowledge of anatomy or histology, so instead of being an aid in diagnosis, it really is a detriment.

A thorough understanding of the anatomic structures and landmarks of the oral cavity was well pointed out by the essayist. To the beginner in radiography every film which shows teeth or roots or dark spots is a revelation, and the majority of dentists are satisfied with radiograms of an inferior quality, from which a diagnosis is difficult to obtain.

A good routine technic and skill are essential in a radiodontic examination, and everyone who has intelligence and sufficient interest in the subject can develop it. The specialist has no monopoly, with all due respect to the essayist. It must be borne in mind that moderate laxity may nullify the benefits of the radiogram by failing to disclose existing pathologic conditions, thus causing an incorrect diagnosis by a misleading portrayal of conditions.

It goes without saying that technical standards are only possible when the dentist who operates the machine knows exactly what to expect from it.

To understand the abnormal or pathologic structure, one must have a perfect knowledge of the normal anatomy and histology.

A patient, a man of forty, called at my office sometime ago for an examination. He appeared to have a slight swelling in the region of the mandible between the second pre-

molar and third molar. The second premolar was a crowned tooth, and was valued very much by the patient as it carried a clasp of a lower appliance. The radiographic examination revealed a rarefied area at the apex of the tooth, and there being a condition of pyorrhea present, I advised an extraction.

Needless to say this recommendation did not appeal to the patient, and as often happens, he consulted his family physician. The latter by looking over the radiogram suspected a cancer, but changed his mind after convincing himself of the presence of the normal histologic character of the bone. The patient had the premolar extracted, the area curetted and is in good health now.

The uses of the radiograph in dentistry are numerous and most of them were mentioned by the essayist. I wish to summarize their diagnostic purposes:

1. To determine the proximal contact points, especially in pyorrhea.
2. To examine the laminadura.
3. To observe histologic changes.
4. To have a conception about the crest of the alveolar ridge.
5. To check up on root canal work and orthodontia, etc. In osteology fractures trismus, to determine form or position of impactions and foreign bodies, etc.

To one who is frequently called by the internist to clear up general systemic conditions, the use of the radiogram is indispensable.

Again I wish to repeat what I mentioned before: In baffling cases we will sometimes be disappointed in our use of the radiogram, for it should be borne in mind at all times that it is only an aid, and other methods should not be overlooked. Even in cases when the radiogram shows negative results a useful purpose has been accomplished. Too often a diagnosis is arrived at by a process of elimination.

THE TECHNIC OF ORAL RADIOGRAPHY

By Dr. Clarence O. Simpson, St. Louis, Mo.

OCCLUSAL VIEWS

Mandibular Regions

(Continued from page 111.)

Position of Head. Reclined to the limit of flexibility with the body erect, in the attempt to place the occlusal plane vertical.

Anteroposterior Angle of Projection. Ten degrees posteriorly to the perpendicular of the occlusal plane for examination of the entire arch, or parallel with the longitudinal axes of the teeth for examination of a particular region.

Lateral Angle of Projection. Perpendicular to the occlusal plane for examination of the entire arch, or parallel with the longitudinal axes of the teeth for examination of a particular region.

Placement of Film Packet. Number 2 films placed with the longer dimension laterally for examination of the entire arch, or Number 1 or 1*a* films placed with the longer dimension mesio-distally for examination of a particular region.

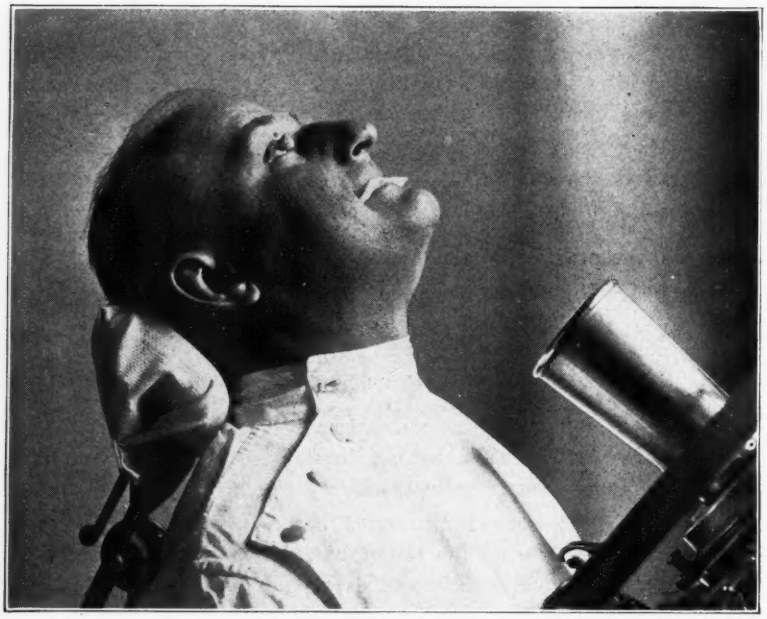

Fig. 1.—Position of patient and cone for an occlusal view of the mandibular incisor region.

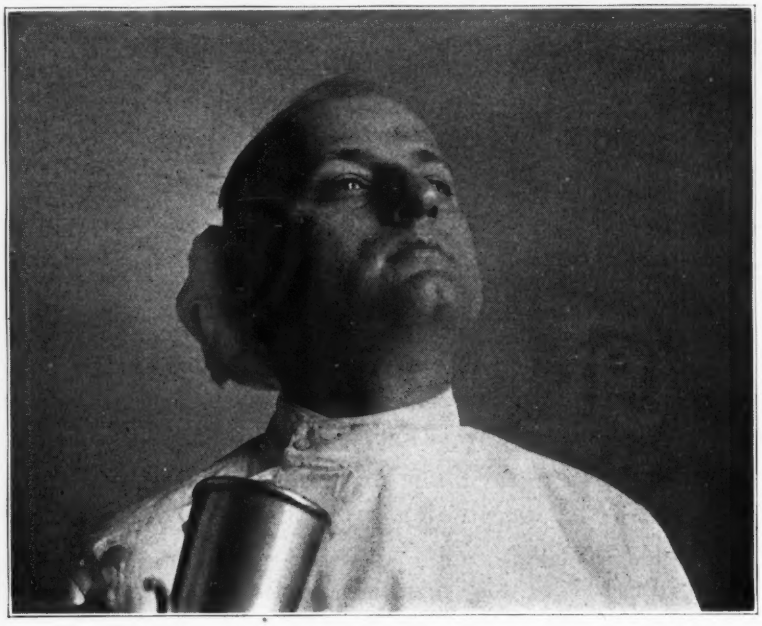

Fig. 2.—Position of patient and cone for an occlusal view of the mandibular molar region.

Retention of Film Packet. Firm pressure of the opposing teeth on the packet.

Cone. Centered at the center of the arch for examination of the entire arch, or at the center of the region for examination of a particular region.

Spark Gap. 5 to 5½ inches.

Exposure. 160 to 200 milliampere seconds at a 20 inch target-film distance.

Explanatory Description. Occlusal views of the mandibular regions are less obscured by superimposed structures, but the operative technic is more exacting than that of the maxillary regions. The principal difficulties en-

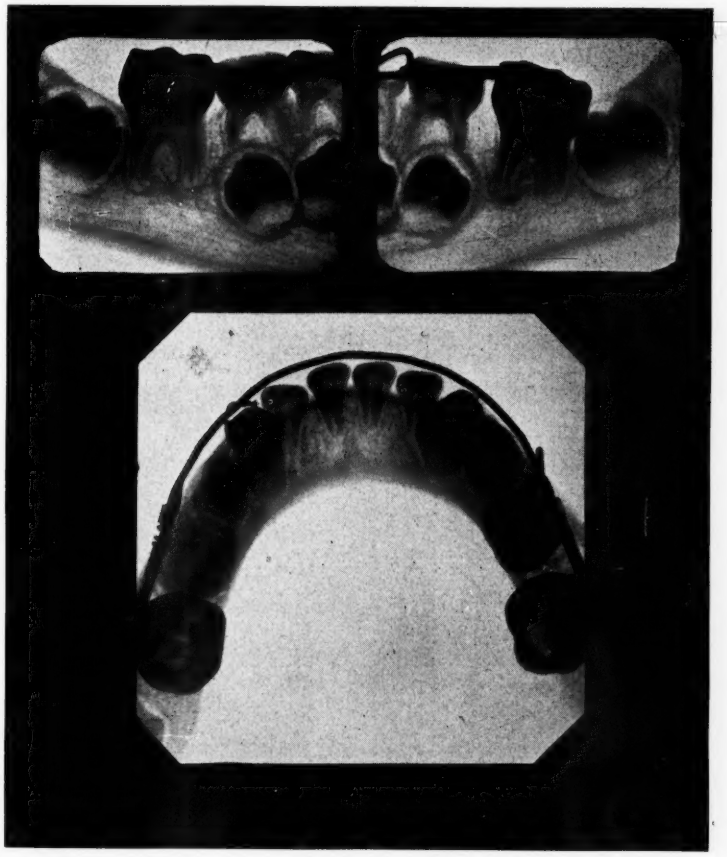

Fig. 3.—Occlusal view of mandibular arch in young patient.

countered are the uncomfortable pose, the proximity of the tube to the patient, and the lingual inclination of the posterior teeth.

The pose presents little difficulty with young or supple patients, but with elderly or obese patients, especially women with liberal bust development, the physical limitations materially impair the results. Some types of tube stands and brackets do not permit the tube's being placed in the proper position for these examinations and with any equipment care must be exercised in keeping the high voltage connections a safe distance from the patient. A rubber mat placed over the body and arms of the patient is an additional precaution.

The convergence of the mandibular teeth in different planes from the divergence of the rays precludes a true occlusal view of the entire arch, but a rather satisfactory view of the dentition to the age of twelve is possible. After the eruption of the permanent teeth, at least three views are required to approximately parallel the longitudinal axes of the teeth: one for the incisors and canines, and one for the premolars and molars on each side.

Fig. 4.—Localization of an odontoma and displaced tooth in mandibular incisor region.

Fig. 5.—The upper lingual view had been misinterpreted as absorption of the second molar, and the tooth condemned. The occlusal view shows the direction for the rays to disclose the relation of the second and third molar. The lower lingual view in this direction shows the second molar intact, and changed the indications for treatment to the removal of the third molar.

Films of the 1*a* size are suitable for the three view method, but for examination of a particular region the metal backed Number 1 films produce the best results.

To accurately parallel the longitudinal axes, close observation of the position of the teeth and the direction of the cone is required after the pa-

tient is posed. In the first attempts, the operator usually underestimates the inclination of the teeth, and fails to obtain a true occlusal view. For an illustration of the marked lingual inclination, in the second molar region the average lateral direction of the rays for an occlusal view is through the teeth and the tip of the nose.

It is especially necessary to parallel the longitudinal axes of the teeth for localization in the incisor region, as a slight deviation will be misleading in relations around the apices of the teeth. When the prevalent labial inclination of the incisors is so extreme that the rays cannot be correctly directed incisally, the method may be reversed for a submandibular view by

Fig. 6.—A lingual view showing an apparent lingual displacement of an impacted third molar. The occlusal view reveals it as a buccal displacement.

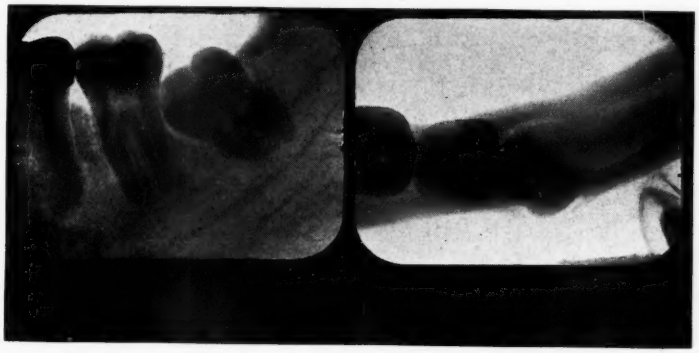

Fig. 7.—Distortion of an occlusal view from bending of the film in attempting to cover a too extensive field.

placing the film under the chin and directing the rays apically. For this method the head is slightly inclined; the film resting on a flat object is pressed against the lower border of the mandible with the surface as nearly perpendicular to the teeth as possible; the mouth is opened to the limit and the rays are directed downward parallel with the longitudianl axes of the teeth.

In obtaining occlusal views for the localization of unerupted third molars, the film packet should not be forced distally until bent by the ramus. In most cases only the crown of the third molar can be included, and an attempt to extend the field beyond this point results in objectionable distortion of the image. The posterior buccal corner of the packet should be sharply bent

upward, and the packet carried distally until it meets the obstruction by the ramus.

In placing the packet for occlusal views of mandibular regions, allowance should be made for the angle of projection so that the image will be symmetrically registered on the film. This requires the greater portion of the packet to be placed toward the lingual for the posterior regions, and toward the labial for anterior regions. The location of the packet should be determined before the teeth are closed, as the heavy impact produces indentations which are visible in the developed film. The exact placement of the packet can best be controlled by firmly grasping the external edge, resting it on the mandibular teeth, and following the movement of the mandible until the packet is retained by the opposing teeth. In directing the patient to bite on the packet, the instruction should be to "slowly close" instead of "close slowly" to avoid the impulsive completion of the act before the verb can be modified.

The exposure recommended is for "regular" films, as "extra fast" films are indicated only for occlusal views of maxillary regions or other special requirements.

(To be continued.)

ABSTRACT OF
CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

The Undeveloped Field of Dental Hygiene. Bourquin (Warren, Pa.) The Dental Cosmos, January, 1924, lxvi, 1.

Dental hygiene is the first step or preparation for preventive dentistry. There are, in round numbers, 50,000 dentists in the United States, so that there should be no dearth in this kind of instruction, but the practising dentist, although in theory upholding preventive dentistry, does not always inculcate its importance to his following. The problem in a broad one for there is now a concerted action to eliminate the social parasite and this can be done only through education. The individual who neglects the teeth is in the long run the one who is remiss in general, although not all who neglect the teeth are ne'er-do-wells. The usefulness of women in this field should be far reaching, for they are the natural watchers and admonishers and caretakers who assume responsibility for others than themselves. The new profession of dental hygienist is hers by right and precedence. She does more than instruct, for she can scale and polish and massage in the interest of prophylaxis. She comes in contact with intelligent people who brush their teeth, yet suffer from calculus and overred or pale gums which need attention. The public are willing to believe that sound subjects usually have sound teeth. When caries and pyorrhea develop the subject is menaced in his health and when these conditions are corrected he is no longer menaced. Much of the routine dental work, however, is defective and it is the very one who thinks his teeth have been kept in shape who is most likely to be deceived. He may suffer from leaky fillings or badly fitting crowns or bridges. The dental hygienist can do good work in these cases as well as in those who have never consulted the dentist. The work of the dental hygienist also extends to the pregnant woman in the interest of prenatal care of the next generation. In this connection she also enters the field of cookery in general and of diet, for both subjects are of vast importance for the teeth of future generations.

A Consideration of Evidences on Oral Sepsis in Relation to Systemic Disease. Lee K. Frankel (New York). The Dental Cosmos, January, 1924, lxvi, 1.

The author, who is a layman and high official in the Metropolitan Life Insurance Company, first mentions the report of the company's dental di-

rector, Dr. Hyatt, who showed that school dentistry influences favorably the scholarship of the children in a certain Southern city. Although of extreme interest the report was not sound from the standpoint of the professional statistician. The case was not proved "up to the hilt." Dr. Hyatt then asked what more he could have done under the circumstances to clinch the matter and this the author proposes to state, as well as he can. The criticism amounts to this, that the improvement shown in making the grades was not proved to be the result of school dentistry, for there was no comparison with other schools in which this dentistry was not practised. The same difficulty obtains in connection with the supposed systemic effects of oral infection. Preventive and curative dentistry has sometimes accomplished wonders among the policy holders of the Metropolitan, and in addition infected teeth appear to be a factor in about 10 per cent of the company's fatalities. But we should have control figures to show how often dentistry fails to relieve rheumatic and other affections. Schottmuller of Hamburg in 10,000 bacteriologic examinations has not seen a single proved case of oral systemic infection. Sometimes extraction of perfectly sound teeth has cured these various complaints. The Metropolitan has made an extensive analysis of 17,000 policy holders according as they have "light" or "heavy" dental work, the latter term implying crown and bridge work. The percentages of disorders usually connected with oral infection show little difference for the two types, but the light dentistry group seems to have a little the best of it, although not enough to be decisive.

More Light on Trigeminal Neuralgia. Feldman (New York). The Dental Cosmos, January 1924, lxvi, 1.

The author takes up the subject of alcohol injections in the treatment of this affection, as carried out especially for the past fifteen years by general surgeons. He does not go into the history and does not comment on the propriety of dental surgeons encroaching upon a well-known province of neurologic surgery. It is, of course, notorious that these neuralgias are often associated in the lay mind with dental disorders, and it is at once apparent that the dentist has a field in the diagnosis and ultimate disposition of these cases. There are half a score of local disorders which might set up a facial neuralgia, and it is well within the province of the dentist to cure these cases by dental resources. But if the trouble be not concerned with the teeth, the propriety of control by the dentist or even by the oral surgeon raises a novel question. The author quotes a case of extremely painful tic douloureux in which a dental cause could readily be invoked—an unerupted and impacted wisdom tooth. Removal of this foreign body naturally caused relief and the patient was not bothered again for five months. However, the pains then recurred and the author thereupon injected 2 c.c. of 95 per cent of alcohol into the inferior dental nerve. There was no further recurrence for a year when the injection had to be repeated. The periods of immunity became shorter and finally it was thought best to resect the nerve in continuity.

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EDITORIALS

Orthodontic Patents and Resolutions

IN this issue of the Journal will be found a set of resolutions which were passed by the New York Society of Orthodontists. We believe it is the first society to pass resolutions taking a definite stand in regard to patents on mechanical devices for the treatment of human suffering and deformities. The medical profession has long ago made itself clear regarding patents, and has stated that any man who obtains a patent on any mechanical device or instrument used in the treatment of human sufferings or deformities, or upon any process for the treatment of any disease, would be considered guilty of unethical practice and would be denied membership in medical societies. The only variation that exists is that in some instances a surgeon is allowed to patent an instrument provided there are other instruments

which, in the mind of the profession, will accomplish the same purpose. Any patent which produces a monopoly on an instrument or device is not tolerated by the medical profession.

Unfortunately the dental profession has never taken such a decided stand against patents, and this is to be regretted. We have recently heard many arguments in favor of advancing the standing of the dental profession and urging that the dental profession should receive the same recognition as the medical profession. We believe that the dental profession will receive the recognition to which it is entitled when it is willing to take the same attitude in regard to patents as the medical profession has held for years.

Recently the dental profession was embarrassed by having as president of one of the largest dental organizations in the country, a man who was notorious in obtaining patents of various sorts, and who spent his entire professional life making researches for the purpose of developing the patents of certain methods employed by the dental profession. It was quite a difficult matter to explain to some of the medical journals and medical men the attitude of the dentists in allowing such a man to assume one of the highest offices at the command of the Society. The dental profession has evidently failed to profit by this mistake and the criticisms of the medical men, because a similar condition is about to occur again by the elevation to a high office of a man who is interested in a concern making a preparation which many men think will be a detriment to the public if the sale of the article is allowed to continue.

A great many of the more prominent and respected men in the orthodontic profession seem to be dominated by commercial ideas to such an extent that regardless of their professional standing in the community they have secured patents on various appliances and devices. Some of these patents have not been used to control or produce a monopoly, while others have been used to restrict the use and manufacture of the patented article.

The reason for the Resolutions passed by the New York Society of Orthodontists is that one of the younger members in the Society developed a particular form of lock for lingual appliance which, after it had been given to the profession, was patented by another man. This occurrence was very unusual and resulted in the passing of the Resolutions in the New York Society of Orthodontists.

The presidential address before the American Society of Orthodontists in 1922 gave suggestions concerning patents on orthodontic appliances, but no action was taken by the Society in reference to it. In fact the suggestions were turned over to a committee which promptly pigeonholed the whole matter. This was probably done because many of the members of the American Society of Orthodontists hold patents on many devices. Furthermore, these men who hold patents have occupied prominent positions in the society; some have been presidents or have sat on important committees.

We hope the Resolutions passed by the New York Society will be a pattern for other orthodontic and dental societies. By a united effort we may be able to educate the men in the profession so that they will not tolerate such methods as are mentioned in these Resolutions.

ORTHODONTIC NEWS AND NOTES

Resolution Adopted by New York Society of Orthodontists

The following resolution was unanimously adopted at the annual meeting of the New York Society of Orthodontists, held in New York City, February 27th, 1924.

WHEREAS: The progress in the practice of Orthodontics depends upon the free and unlimited development of mechanical ideas, as applied to orthodontic appliances; and in the free interchange of ideas among members of the profession; be it therefore

1—RESOLVED: that the practice of individuals, companies or corporations in obtaining patents on mechanical devices, appliances or instruments, and using said patents to discourage or prohibit the use of any devices, appliances or instruments be considered by this Society as unfair to the members of the profession and detrimental to the advancement of Orthodontics and; be it further

2—RESOLVED: that when individuals, companies or corporations are guilty of such acts that they be notified by this Society, and that their action is considered to be against the best interests of the science of Orthodontics and further

3—RESOLVED: that a copy of these resolutions be spread upon the minutes and published by the various dental journals.

The Alumni Society of the International School of Orthodontia

The officers of the Alumni Society of the International School of Orthodontia have decided to dispense with the annual program in order to concentrate their efforts and interests on the American Society program.

There will be a call luncheon or dinner meeting during this time for election of officers, and such business as may be necessary.

Life's Thrills

'Tis 1 A. M. The wind which moans and groans outside causes the curtain at the open window to rattle against the shade in curious fashion. But is it the wind?

Weary from a twelve-thirty date, an hour's chat and a half hour's study, at two o'clock a fair McMillanite is trying to coax a necking party with Morpheus. She is partly successful. Her eyes grow heavy, she yawns sleepily.

The sighing wind seems to enhance the stillness of the night, and ever and anon comes the mysterious knocking of the shade.

POP!! BANG!!! Oh! that stinging sensation in her cheek! The torture —the unutterable pain of it! She groans, for she knows it is no chance wanderer of the night who again causes her so much suffering. She knows who it is.

Will he forever dog her trail? Forever make her life a living death and unspeakable torture? "My God, No!" she swears.

On her little bare feet she creeps from the bed on the cold floor. For years he had caused her to suffer—for years he would cause her to suffer. Unless .....?

Steathily she gropes her way towards the dresser and quickly opens a drawer—she draws forth a box,—she grabs a small round object from it. With a resolute air she puts this small object into her mouth. She has done the deed!

Her years of suffering WILL end. She goes to bed. Her eyes grow heavy, she shudders, her eyes close. Again she shudders—the image of the cruel man who alone prevents her marriage is before her. With malice aforethought, he threatens—

Forever you must wear those braces unless you put another rubber band on whenever one breaks!

What a cruel orthodontist!

—By the Patient of an Orthodontist.
Leah Altheimer.

The St. Louis Study Club of Dentistry

The St. Louis Study Club of Dentistry will hold its Sixth Annual Clinic and Dinner on Saturday, April 5, at the City Club, Eleventh and Locust Streets, St. Louis, Mo.

A cordial invitation is extended to all ethical dentists to attend the clinical demonstration of the advanced work in dental science of the students in this organization, the following classes:

Root Canal Technic;
Oral Diagnosis and Diseases of the Mouth;
Conduction and Local Anesthesia;
Radiodontia;
Removable Bridge Work;
Fixed Crown and Bridge Work on Non-Vital Teeth;
Porcelain Technic;
Cavity Preparation and Casting Technic;
Full Dentures.

The clinic will start at two o'clock, and will continue until five. Following this, a dinner in honor of the faculty will be given by the students of the various classes at six o'clock. To this, the profession is also invited.

Bulletins, descriptive of the clinic, may be had by addressing the Secretary of the Study Club, Dr. Max Stone, Arcade Bldg., St. Louis.

The Dental Society of the State of New York

Preliminary Program

The 56th annual meeting of the Dental Society of the State of New York will be held at Kalurah Temple, Binghamton, N. Y., May 7th, 8th, 9th and 10th, 1924.

A cordial invitation is extended to all ethical practitioners, residents of New York or adjoining states. Admission to all literary meetings and clinics will be upon presentation of cards showing membership in State or American Dental Societies.

All literary exercises, clinics and exhibits will be held in Kalurah Temple. Dr. Thomas R. Cullen, Oswego, N. Y., is chairman of the Exhibits Committee, and those desiring space should communicate with him immediately.

The headquarters are at the Hotel Arlington. Hotel reservations should be made direct with the hotel management.

The Executive Council will meet, for the transaction of business, Tuesday, May 6th, at 3:00 P.M.

The program is as follows:

WEDNESDAY, MAY 7

10:00 A.M. Invocation. By Rev. Dr. Tanner.
Address of Welcome. By Mayor Giles.
Address of Welcome Binghamton Dental Society. By Dr. Leo Brady.
10:45 A.M. Vice President's Response. By Dr. J. W. Canaday.
11:00 A.M. President's Address. By Dr. Charles M. Dunne.
11:30 A.M. Committee Reports and Scientific Research.
2:00 P.M. Some Fundamentals Advisable in the Construction of Full Dentures. By. Dr. Charles Lane, Detroit, Mich.
4:00 P. M. Report of Insurance Committee.
Report of National Relief Association.
8:00 P. M. An Original Method of Applying Porcelain and Fixed Bridge-Work and Simplified Jacket Crown Construction. By Dr. William H. Elliott, Detroit.

THURSDAY, MAY 8

9:30 A. M. Crown and Bridge-Work and the Manipulation of Inlay Waxes, Investment and Casting Gold. By Dr. Emory C. Thompson, Warren, Pa.
2:00 P. M. Surgical and Progressive Clinics.
6:30 P. M. Oral Hygiene Dinner. Prominent speakers on this subject, from various parts of the country, will be heard after dinner.

FRIDAY, MAY 9

9:30 A. M. Clinics and demonstrations by the Dental Hygienists Association of the State of New York, and the Dental Assistants Society of the State of New York.
2:00 P. M. A Further Consideration of Apical Infections. By Dr. Thomas L. Gilmer, Chicago, Ill.
4:00 P. M. Reports of Officers.
8:00 P. M. Presentation of the Jarvie Fellowship Medal.
The Relation of a Healthy Mouth to a Healthy Body. By Dr. Harvey W. Wiley, Director, Bureau of Foods, Sanitation and Health, Washington, D. C.

SATURDAY, MAY 10

9:30 A. M. Surgical and Table Clinics.

Honorable Henrik Shipstead, United States Senator from Minnesota, a member of the dental profession, has accepted an invitation to attend the meeting and make an address.

During the time of the meeting of the New York State Dental Society, sessions of the New York State Dental Hygienists Association and the Dental Assistants Association will be held.

Every effort is being put forth to make this meeting one of the most attractive in the history of the Society. A cordial invitation is extended to all ethical practitioners. Application has been made to the Trunk Line Association for reduced railroad rates. For further information and programs address A. P. Burkhart, Secretary, 57 East Genesee St., Auburn, N. Y.

The Eastern Association of Graduates of the Angle School of Orthodontia

The annual meeting of the Eastern Association of Graduates of the Angle School of Orthodontia will be held on Monday and Tuesday, May 12th and 13th, at the Hotel Vanderbilt, Park Avenue and 34th Street, New York City.—E. Stanley Butler, Secretary, 576 Fifth Ave., New York City.

Ontario Dental Association

The annual convention of the Ontario Dental Society will be held at the King Edward Hotel, Toronto, May 26-29, 1924. An excellent program has been arranged and a record attendance is assured.—Fred J. Conboy, President.

News and Notes

Dr. Carl N. Dorman announces the removal of his offices to 805 Forum Bldg., Sacramento, Calif. Practice limited to orthodontia.

Dr. Mort Henkin announces the removal of his office to 408-9 Davidson Bldg., Sioux City, Iowa. Practice limited to orthodontia.

Dr. O. Henry wishes to announce his association with Dr. R. N. LeCron in the specialty of orthodontia and the care of children's teeth. 15 Stratford Place, London, W, 1.

Dr. Wilson Foster announces the removal of his office to The Doctors Bldg., Garfield Place, Cincinnati, Ohio. Practice limited to orthodontia.

Dr. John A. McPhail announces the removal of his office to 647-650 Doctors Bldg., Cincinnati, Ohio. Practice limited to orthodontia.

Erratum

In the discussion of Dr. J. A. Marshall's paper, January issue, the sixth paragraph, on page 8, should read: *Dr. Taylor.*—Does the biologist recognize it as a fact that we can inherit malocclusion of the teeth?